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Horseshoeing in Hauran*

HAURAN is the southern part of Syria which is bounded by Palestine. The terrain is volcanic in the hilly regions and of calcareous clay in the plains. The climate is healthy; the heat is not excessive. Rains are periodic, abundant toward the end of winter. Streams and springs are rare, barley and wheat the principal products of the land.

It is a very ancient country whose history extends to the remotest antiquity. It was reputed for its oak forests by the Hebrews but these have disappeared; Bosra was already a crossroad for caravans. Hauran was successively a part of the empire of David, of the *emâire* of Assyria, the empire of Persia, and the empire of Alexander. It was actually colonized by the Romans, who left traces of their interesting architecture and civilization. Byzantine continued the influence of Rome. Then the Arabs of Hedjaz gave definite impetus to the race by imposing their religion and morals. The Croisés passed. Then came the Kurds and then the Turks, who dominated for a long period.

The Hauranian, living at the far end of the Mediterranean and Arabian world, is not of a definite racial type, but by his manners, habits and tastes, he is, above all, more than just Arab. He loves horses and enjoys racing. There are no roads in Hauran. In the caravans, asses, mules and camels are the pack animals. Horses are used only for riding. The Hauranian horse is small, robust, active and courageous. Its conformation is graceful and its head expressive. It is an Arabian horse, in fact. The stables are miserable, of low ceiling and no opening other than the door. The walls are of dried stone, made by mixing mud with cut straw. The manger is hollowed-out stone and there are no racks. The floor is tamped ground and the litter is the excrement. The horses are generally shod at the age of 2 years. The first shoes are light and are worn but 2 weeks. Well kept horses are shod every 50 to 60 days, others every 3 or 4 months.

THE HORSESHOER'S OUTFIT

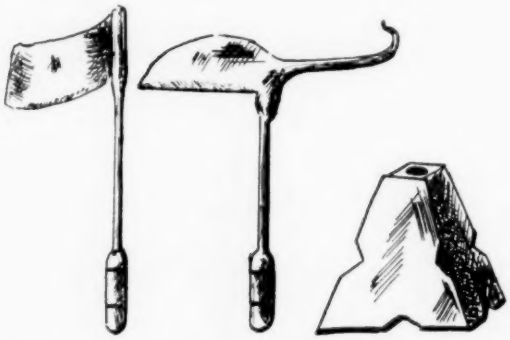
The Hauranian horseshoer has no shop. He doesn't need one. A niche under a stairway, the corner of a lot, provided there is shade, and a door frame are sufficient.

The tools consist of a small anvil, a hand hammer, a pyramidal block of iron, two buffers (hoof knives), a pair of trimming pincers, a rasp, a punch, and a disc of wood,

*Captain Lacan: La Ferrure dans le Hauran (Horseshoeing in Hauran). A free translation from Revue de Médecine Vétérinaire, xci (Jan., 1939), pp. 27-33.

all of which, with the nails and shoes, are easily transported in a box.

Some of these horseshoers, tempted by modernism, have tried the European method but have become discouraged and returned to their archaic procedure, which is more to their liking.



Hoof knives and foot rest used by the Hauranian horseshoer.

The anvil is of very small dimensions. It is fixed to the ground between two large stones. The horseshoer can use it to sit on with legs folded. The pyramidal block used to pierce the holes in the shoes is perforated from top to bottom and its truncated summit serves also as a table. The hammers, buffers, pincers, and punch are identical with ours. The buffers are very peculiar. One of them, the Kaaftier, has a blade of 15 cm. in length and 8 cm. in width, curved like a carpenter's plane and armed at one extremity with a handle of 30 to 40 cm. set perpendicular to the blade. The other has a blade like the Kaaftier but is armed with a wing which is taken in hand to handle with more force and certainty. These are handled like the paring knife, by drawing to and never away from the operator. The disc of wood or "Orma" is 30 cm. in diameter and 5 cm. thick. It is the shoeing block. The spatula, or "Sinda," is used for riveting. It is 20 cm. long. The nails are often English nails of commerce, but sometimes they are made with a large head by hand.

The Hauranian horseshoer is a man of importance. His clients listen to his advice and he likes to explain the merit of his science. He is honest and patient and religiously practices the precepts of the Koran.

THE HAURANIAN HORSE SHOE

The shoe is exclusive. It is a plate cut by hand from a metal sheet 6 to 8 mm. thick. It is cut cold with strong snips often made of two old rasps riveted together at one of the extremities and sharpened. The shoe is oval in form, with the large curvature forward. The small end is made to extend beyond the hoof behind and is bent upward over the heels like the Moroccan shoe. The shoes for horses and mules are classed in eight sizes, from 0 to 7. Size 0, the largest, corresponds to our No. 40 and size 7 corresponds to our No. 28. The large size is perforated with eight holes, the small ones with only six, distributed along the border far from the toe. Shoes for mules are classed in four sizes, 5 to 8, but here the size 5 is the smallest, and the size 8 the largest. The shoe of average size weighs 300 grams.

PREPARATION OF THE SHOE

Having cut out his shoe, the horseshoer kneels down in front of his anvil, with his vessel of very fresh water aromatized with lemon and peppermint. With the punch he at once punches a hole through the middle of the shoe. The hole serves uniquely to hang the shoe on the point of the anvil and, later, also to aërate the sole. With the left hand holding the shoe and the right the hammer, he hems the border of the shoe inferiorly with a succession of well measured taps. The hem is 3 to 4 mm. wide. He then puts the shoe in the water to hollow it out on the superior face, then bends the posterior end upward. All of these operations are done cold. The nail holes are made with the punch on the metallic block. There is no difference made between right and left or fore and hind shoes. The shoes differ only in size.

THE SHOEING

The Hauranian horseshoer uses a helper to hold the foot. If the horse is intractable, he uses an enormous twitch attached to the halter. The feet are pared and shod suc-

cessively, one after the other. The Kaaftier, employed for paring the foot, is drawn toward the operator with the right hand as the left steadies the foot. This operation is a bit dangerous. While done skillfully, little attention appears to be paid to the thickness of the horn. When the paring has been done, the shoer chooses a shoe and fits it to the foot. If the shoe appears to be of the proper dimensions, it is accepted without other preoccupation. To impress his client he now manifests a curious activity by taking pains seemingly to adjust the shoe here and there, always with a serious imperturbability and without making any explanations that would be useless because they would not be understood.

When satisfied with his work, the shoer fixes the shoe to the foot by driving a nail first inside and then one outside, and the remainder without order. Always the hoof extends 1 to 2 cm. beyond the shoe at the toe and much less along the sides. The nailing is often irregular but that does not bother the Hauranian horseshoer. All of the shoes are nailed on before the nails are riveted. This plan is believed to be better than finishing the job on each foot at the time. The shoer has the curious habit of wanting the nail heads oriented in the same direction—the direction of the gait. For him, this is important. Its purpose is to prevent slipping, the same as hemming the external rim.

To rivet the nails, the foot is placed upon the disc of wood, while the helper lifts the opposite leg. The nails which were lying flat against the wall, until now, are cut off with the pincers several millimeters from the hoof. The riveting is done in a peculiar fashion. The handles of the pincers are slipped under the shoe behind to pivot the foot from the disc far enough to slip the spatula under the nail head while the nail is riveted and tightened with the hammer. This is continued one nail after another. The last operation is to remove with the pincers the part of the wall that overlaps the shoe at the toe and sides. It sometimes happens that the trimming is too deep and reaches to the blood. But this is an accident that the good shoer avoids. If the accident does occur, the help of Allah is invoked and repairs the damage, naturally for a small fee. The rasp completes the job.

REFLECTIONS

The horseshoeing of Hauran is curious from its originality and it is interesting from the archeologic point of view. Those who practice this art belong to a very old race which has changed but little from Biblical times, whose traditions crystalized at the time of the Arabian conquest and were little modified by Turkish domination.

It is remarkable that the present horseshoeing of Hauran recalls the shoeing described in *Tactique militaire* by Emperor Léon VI of Constantinople, at the end of the ninth century, A. D.

The most ancient of all iron horseshoes.

The *"pedicla sélénaia meta carphiôn autôn"* is understood by the Latin translator as signifying *"calceos lunatos ferreos cum ipsis carphiis, id est, clavis,"* which is translated, "shoes of iron shaped like the moon, with their nails."

It is truly tempting to see in the present horseshoeing of Hauran that the most primitive form of the art has been curiously conserved, obviously the most primitive form in which nails are used. The Greeks and the Romans did not know horseshoeing with iron. They protected the feet of their horses with boots of leather held on with straps, although sometimes these boots were garnered with strips of iron, *solea ferrea*. The horseshoeing of the Hauranian people of this hour is veritably

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Sources of Error in the Agglutination Test for Bang's Disease*

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IT IS A known fact that the agglutination test, like all other biological tests for the diagnosis of disease, has its element of error. Experience has already shown that this element of error is not great enough to prevent us from using it satisfactorily to control Bang's disease. Our purpose at this time is to analyze the sources of these errors, to evaluate them, and to consider ways and means further to minimize them. Much of the existing confusion is entirely unnecessary and could be eliminated readily, if all parties concerned would get together and accept and apply the existing accurate knowledge pertaining to the application of this test.

For purposes of discussion let us divide the sources of error into four parts and consider them separately. These four parts are (1) preparation of antigen or test fluid; (2) conducting the test; (3) interpretation of the results; and (4) general considerations. The type of test that is used will not be considered in this discussion, since the sources of error are comparable in the different methods of testing.

PREPARATION OF THE ANTIGEN OR TEST FLUIDS

It is true that the antigens which are being used are not all uniform in sensitivity. This situation is directly comparable to that which existed in regard to tuberculin during the early efforts to control that disease. The federal bureau of animal industry is to be commended for steps taken very recently which, it is hoped, eventually will provide uniform, standard antigens for this test. This bureau has definitely made preparations to supply testing antigen to all laboratories coöperating with it in this work. Sufficient money has been made available to provide laboratory facilities and a proper organization to carry out this plan. It is hoped that with the organization in charge of this work, it will be possible to supply uniform antigen at all times. This in itself will unquestionably avoid many of the discrepancies in the application and reading of the test which have occurred in the past.

CONDUCTING THE TEST

Due to the human element in preparing and observing test dilutions, there are errors which never will be eliminated entirely. Such errors can be compared directly to the similar errors in making the injections of tuberculin into the animal body. We all know that some cattle have been sprayed with tuberculin rather than injected with it, and that there have been other inadequacies in the actual operation of applying the tuberculin test. This type of error can be minimized in the agglutination method by following the same principles that have been used with reference to similar errors in the diagnosis of tuberculosis. This is accomplished by placing the responsibility in the hands of the individuals who are conducting the test and demanding reasonable care and accuracy. The errors from this source need not be any greater than they have been in the test for tuberculosis. In fact, there is legitimate reason to expect and demand even more accurate work in the agglutination test because of the better working conditions under which the tests are applied.

*Presented at the Twelfth Veterinary Conference of the College of Veterinary Medicine, The Ohio State University, June 14-16, 1939.

(Continued from page 135)

the most direct heredity of *solea ferrea* and is the most ancient, the most archaic practice passed down to this day. It is precisely that which makes it so interesting. Moreover, it meets the needs of those who practice it—it is fitting for the animals that carry it—and is praised by Allah.

INTERPRETATION OF THE RESULTS

Possibly the greatest source of error results from variations in the interpretation of agglutination results rather than in the conduct of the test itself. The agglutination test should be considered as an invaluable aid in diagnosis, but should not be the sole source of evidence. The facts are that all too frequently the diagnoses are arrived at according to hard and fast rules. This is wrong because such practice ignores the fundamental principle of diagnosis, namely, to consider and weigh all available evidence. For example, we would much prefer to accept as negative an animal with a low agglutination reaction from a herd with a clean history rather than to accept an animal with a completely negative reaction from a herd with either a high percentage of infection or evidences of a rapidly spreading infection. It is absurd to try to operate in this regard according to inflexible standards. We must have certain schedules as guides for interpretation of agglutination results, but we certainly should not use them to the exclusion of common sense and good judgment in making diagnoses.

Most men will agree that a veterinarian who sees the cows and talks with the owner or herdsman has a tremendous advantage over another veterinarian in some distant laboratory when the time comes for the final decision on individual animals. We should work toward the ultimate objective of placing the responsibility of diagnosis with the field veterinarian. Obviously, the success of such a policy will depend on having a personnel of responsible, adequately trained, field veterinarians. We should consider that the veterinarians of America have become Bang's disease-minded during recent years and have made and are making rapid progress toward informing themselves concerning the scientific facts relating to the control of this disease.

There are a few control officials who believe that centralized control of diagnosis is necessary. We would remind these men that the field veterinarians have carried the full responsibility of diagnosis in the tuberculosis eradication work and, further, that no real progress was made in this program until this situation obtained. Certainly, no one can deny that these men have exercised judgment in the interpretation of tuberculin reactions. Attempts to establish fixed standards of interpretation of tuberculin reactions were abandoned very early in that work. There is a great deal more to the job of controlling and eliminating Bang's disease than the routine task of collecting blood samples and testing them. In all medical practice the diagnosis of disease is left to the clinician, not to the laboratory force, who conduct certain tests for the purpose of aiding the diagnostician.

In Bang's disease testing there is a restraint on any field veterinarian who might be inclined to make intentionally incorrect diagnoses. Such restraint does not exist to the same degree in testing for tuberculosis. He knows that there is nothing to prevent check tests at any time in Bang's disease, while in tuberculosis animals can not be check-tested satisfactorily for a considerable number of days after an initial test. The cattle industry of America is dependent upon the integrity of the veterinary profession and everyone knows that it has merited the trust which has been placed in it. We should not make the mistake of judging the profession by its small, incompetent, unreliable fringe.

The field veterinarian's interest in the whole project is quite naturally and very largely in ratio to the responsibility placed in him. If he is merely a "cow puncher," he is frequently a disgruntled, disinterested, bread and butter worker. When he is the responsible diagnostician acting in an official capacity and his work is compared to that of his fellows, he usually accepts that responsibility with enthusiasm. The result is that the entire project is elevated to a basis of greater efficiency.

GENERAL CONSIDERATIONS

We are all plagued with the erroneous concept regarding the symptom of abortion and its relation to agglutination reactions. We still have thousands of farmers who think that the reacting cow must abort and

that the aborting cow must react. We likewise still have many veterinarians who attempt to think in terms of abortions and reactions, but it just won't work. Perhaps the reason for this is that for years, in the tuberculosis campaign, we have thought in terms of reactions and lesions. This psychology is hard to overcome, even in our own thinking. It must be overcome because it leads only to confusion, due to the fact that it is founded on an erroneous concept. All of us are inclined to contribute to this confusion by citing, where it suits our purpose, abortions in herds having positive reactors.

There is a period of incubation in all diseases. In Bang's disease it appears to be particularly troublesome because clinical experience indicates that we apparently sometimes find infected animals that do not react to the test until after the termination of pregnancy, either by abortion or normal calving. Fortunately, such animals are not common but, when they occur, they are particularly serious and may upset many months of effort in the control of the disease in individual herds. As far as our knowledge extends today, we simply have to live with this situation. We do not believe that we should accept a defeatist attitude and throw up our hands and say that the test is no good. If we do this, we are right back where we started in that we still have Bang's disease as the most expensive handicap to our cattle industry. The facts are that the agglutination test is a good method of diagnosis. It is the best we have; it is essentially all we have; and it behooves us to meet our obstacles and go ahead rather than throw up our hands and quit.

Experience has shown that our efforts have not been satisfactory in some herds. We continue to find too many reactors in such herds on succeeding tests. Experience has also shown that sometimes we are at fault rather than the test. We often have failed to carry out adequate cleaning and disinfection of the premises. In the tuberculosis work we learned that it was folly to eliminate reactors and do nothing else. Yet, that is exactly what we have done in our Bang's disease-control efforts in entirely too many cases. It is possible that we are overlooking reservoirs of infection in some cases by centering our interest in the cattle and ignoring the other farm animals. Scientific evidence on this point is meager but it is suggested for your consideration that this may explain some of these poor results rather than a failure on the part of the test. Further, we have failed many times to retest herds at the proper time. The minimum period of incubation in this disease is about two to three weeks only. This means that retests should be made at two-week intervals in herds in which there is evidence of a rapidly spreading infection.

On several occasions we have succeeded in stopping the spread of the disease by testing herds every two weeks, where previous efforts had failed with tests once a month. Other herds do not require such frequent tests. Experience and judgment are necessary to decide when to retest a given herd. Such decisions can be made satisfactorily only by the competent field veterinarian.

It is not uncommon to find farmers and veterinarians who become discouraged because of a reappearance of infection in some herds following two or three years without any reactors. Most of these experiences are due to the introduction of infection from outside sources rather than to the failure of the test. Such experiences will continue in communities having a high incidence of the disease among their animals. The answer to this problem lies in the area plan of control for Bang's disease, just as it did for tuberculosis 20 years ago. Furthermore, we must recognize that the incidence of Bang's disease in many areas is greater than it ever was in tuberculosis. The opportunities for such disappointments are correspondingly greater.

There is one angle to this discussion which too frequently is not understood. Nearly all of the error of the agglutination test and its interpretation is centered in a relatively small percentage of cattle showing indecisive reactions. This group of

cattle normally constitute around 3 to 5 per cent. We certainly should not contend that inaccuracy in this relatively small group of cattle should stop our efforts in the control of the disease. When a cow shows a definitely positive reaction, it makes little difference who tests her or which method is used. The results will be the same. When cattle show a completely negative reaction, it again makes little difference when or how the test is done. The results will still be the same. Perhaps we have done entirely too much talking about our "misses" with this test and not enough about our "hits."

Another factor in our thinking about the agglutination method deserves careful analysis. In Bang's disease testing it is customary to test, retest, and check test, and to compare the results obtained by different methods of testing and by different laboratories and different individuals. In the early work this practice frequently was encouraged because it seemed desirable from a psychological point of view. In doing this, however, we should recognize that we have submitted the agglutination test to a very critical analysis. The result has been to publicize the errors in this method in such a way that everyone is conscious that it is not 100 per cent efficient.

In contrast to this, it takes only a casual observation to point out that no such critical analysis of the results of the tuberculin test has been or can be conducted. We all know that the tuberculin test contains its element of error. Yet, in spite of these errors, any thinking person will agree that progress in tuberculosis eradication has been eminently satisfactory. In other words, the very nature of the Bang's disease test invites critical analysis, magnification of the errors and, consequently, sometimes warped judgments.

Grass tetany is apt to occur shortly after cattle are turned out to lush catch pastures of rye, wheat or barley and the accident is more common in dairy cows that have been wintered on a poor ration.—*Quin.*

Cow's Milk Modifies the Voice

At the North Central Music Educators' Conference, Edith M. Keller, Ohio's supervisor of music, declared that feeding cow's milk to babies gives to children the low-pitched voices they have today. Cow's milk develops vocal cords "more like the calf's than like a human's," the speaker stated.

Calfhood Vaccination in Bang's Disease

Products containing virulent cultures appeared to establish a significant degree of immunity when administered in the living form. However, the use of living cultures was attended with several undesirable results which more than outweighed the benefits derived. At the present time, calfhood vaccination offers the greatest promise of success but it seems inadvisable to carry it on in a wholesale way, in view of the limited knowledge of its value. Admittedly, it is still in the experimental stage and should be conducted only under experimental conditions by people well informed on the manner of conducting such experiments, in order that the results obtained may be thoroughly understood and represent the value of the program.

At the present time, the federal government is conducting experiments in coöperation with the various states in about 280 different herds. The undertaking is comparatively new and it will require the data of several more years to evaluate the use of this kind of vaccine in a system of calfhood vaccination under field conditions. In event a system of vaccination is developed that has value, it will never replace the testing and slaughter program, since it is not even claimed that vaccination will cure a cow that is a reactor. It is admitted that the reactor must eventually be eliminated and replaced by a cow that does not react to the test. At best, the vaccination program will never serve any other purpose than to supplement our present sanitary system. *(V. S. Larson, state veterinarian of Wisconsin, Holstein-Friesian association, Peoria, Ill., January, 1939.)*

Second Report on the Use of Large Doses of Sulfanilamide in the Treatment of Chronic Streptococcal Mastitis

By W. T. MILLER, D.V.M., F. M. MURDOCK, D.V.M., and J. O. HEISHMAN, B.V.Sc.

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THE RESULTS of sulfanilamide therapy against Bang's disease and streptococcal mastitis in a small number of cows have been reported in a previous article.[1] In this work, sulfanilamide was found to have no therapeutic effect whatsoever on bovine brucellosis. Against streptococcal infection of the udder, on the other hand, the results were somewhat encouraging.

Two cows with chronic streptococcal mastitis in two quarters each were treated with large doses of the drug. One of these cows was completely cured. During the course of the experiment the temperatures of all of the animals had a tendency to rise after treatment was stopped, and it was noted that the cow which responded to the medication ran the highest temperature for the longest period of time. It was also shown that a concentration of 20 mg. of sulfanilamide per 100 cc. and even more could be attained in the blood and milk when 0.4 gm. of the drug per kg. of body weight was given as the initial dose and followed by 0.2 gm. per kg. every twelve hours. All of the medication was given by the stomach tube. The animals receiving these doses exhibited no ill effects other than a temporary decrease in milk production and some loss of weight.

Inasmuch as the results pertaining to the value of sulfanilamide in the treatment of streptococcal mastitis were inconclusive, it seemed advisable to continue the investigation. It was felt that several ends would be served: First, to test the efficacy of sulfanilamide in the therapy of mastitis due to streptococci and, second, to observe the physiological reaction of large doses of the drug in more animals. For this purpose four cows were selected from a small dairy herd in the vicinity of the Animal Disease Station. These animals were the only ones in lactation in the herd which were affected with chronic streptococcal mastitis.

PROCEDURE

Following selection of these cows as a result of a survey of the milking herd, milk samples were collected from each quarter to determine the number of quarters infected with streptococci. The animals were then weighed and the treatment with sulfanilamide was started. The first dose of approximately 0.4 gm. per kg. of body weight was given in the morning by means of a stomach tube. Subsequent doses were given in capsules, each of which contained 20 gm. of sulfanilamide, by means of a balling gun at twelve-hour intervals. The treatment was continued for six days, or twelve doses in all. Each cow's temperature was taken every twelve hours.

A blood sample and a complete sample of milk were collected from each animal every morning before the sulfanilamide was given and before the cow was milked out. The samples were taken at the same time after treatment was stopped. The latest method of Marshall and Litchfield[2] was used for the determination of the concentration of sulfanilamide in the blood and milk. The portion of the milk remaining after the quantitative analysis for the drug was used for a bacteriological examination for the presence of streptococci in the udder. Both the Hotis test[3] and microscopic examination of incubated milk were used for this purpose. When streptococci were detected by either of the methods, a small loopful of incubated milk was spread on blood (5 per cent horse blood) agar and colonies typical of streptococci picked into serum (10 per cent horse serum) infusion bouillon for further identification in differential media.

The cultures of streptococci which were

isolated from all of the infected quarters at each examination proved to be *Streptococcus agalactiae*. These strains, however, failed to produce acid in trehalose, a point which has been discussed elsewhere,[4] and split aesculin very slightly.

RESULTS

Of the four cows selected for the experiment, one died on the morning of the fourth day of treatment. The animal, which was about 11 years old, went off feed on the second day of treatment. It was noticeably depressed and there was a marked drop in milk production. At this time, the concentration of sulfanilamide in the blood and milk was almost double that found in each of the other three animals. On the afternoon of the third day, the animal was down in a comatose condition with a temperature of 107.1° F. It was reported dead early in the morning of the fourth day. At autopsy, relatively few changes were observed in any of the organs other than the small intestine. There was marked thickening of the intestinal wall, corrugation of the mucosa and a diffuse reddening of the areas involved. Microscopic examination of scrapings from the intestinal mucosa, stained by the Ziehl-Neelsen technic, revealed enormous numbers of small, acid-fast bacilli. This result, considered together with the fact that Johne's disease had been found in this herd in years past, would seem to substantiate the belief that the cow was infected with Johne's disease at the inception of the treatment.

That sulfanilamide was of no value in bringing about a cure of the streptococcal infection in the remaining animals is shown in table I. On the other hand, a temporary disappearance of these organisms from the milk, which was of somewhat variable duration, was observed. It should be pointed out in table I that no streptococci could be found in milk samples from any of the cows by either test on the day following administration of the first dose of the drug. On the second day, streptococci reappeared in the incubated milk samples from cows 20 and 75, and were found in the latter animal for the remainder of the period of observation. In contrast to these two animals, cow 67 failed to shed any streptococci in the milk for six consecutive days. The results with cow 20 differed from the other two cows in that these organisms were found irregularly during this time. As soon as all trace of sulfanilamide had left the blood and milk, however, streptococci could be detected in all three of the animals with regularity by both of the tests. That the drug had some

TABLE I—Results of bacteriological examination of milk samples from cows 20, 67, and 75 before, during, and after treatment with sulfanilamide.

DATE	Cow 20		Cow 67		Cow 75		REMARKS
	H	M	H	M	H	M	
8- 8-38	+	+	+	+	+	+	
8-15-38	+	+	+	+	+	+	
8-22-38	+	+	+	+	+	+	Treatment started
8-23-38	—	—	—	—	—	—	
8-24-38	—	+	—	—	—	+	
8-25-38	—	—	—	—	—	+	
8-26-38	—	—	—	—	—	+	
8-27-38	—	+	—	—	—	+	Treatment stopped
8-28-38	—	+	—	—	—	+	
8-29-38	—	—	—	+	+	+	
8-30-38	—	+	—	+	±	+	
8-31-38	+	+	+	+	+	+	
9- 8-38	+	+	+	+	+	+	

H = Hotis test.
M = Microscopic examination of incubated milk.
+ = Streptococci present.
— = Streptococci absent.
± = Streptococci questionable.

TABLE II—Effect of feeding large doses of sulfanilamide on daily milk production.

DATE	MILK PRODUCTION (LBS.) OF			REMARKS
	Cow 20	Cow 67	Cow 75	
8-15-38	15.5	35.6	24.0	
8-16-38	13.5	34.9	26.9	
8-17-38	14.2	30.3	25.0	
8-18-38	13.2	37.3	25.8	
8-19-38	14.8	34.0	27.7	
8-20-38	14.0	33.7	26.6	
8-21-38	14.4	37.2	28.2	
Totals	99.6	243.0	184.2	
8-22-38	14.6	34.6	27.6	Treatment started
8-23-38	8.2	21.9	20.3	
8-24-38	9.6	22.6	21.6	
8-25-38	8.8	18.5	19.0	
8-26-38	7.0	18.2	17.6	
8-27-38	7.5	19.7	18.0	Treatment stopped
8-28-38	5.2	19.4	19.6	
Totals	60.9	154.9	143.7	
8-29-38	7.4	24.1	13.7	
8-30-38	8.8	25.1	14.0	
8-31-38	11.0	28.6	13.6	
9- 1-38	12.5	26.7	20.2	
9- 2-38	12.5	35.5	23.0	
9- 3-38	14.0	32.1	24.8	
9- 4-38	12.3	33.5	26.5	
Totals	78.5	205.6	135.8	
9- 5-38	13.8	36.5	29.5	
9- 6-38	14.1	35.7	28.8	
9- 7-38	12.8	34.0	28.1	
9- 8-38	16.5	36.3	28.7	
9- 9-38	14.6	34.3	29.8	
9-10-38	14.3	34.9	27.3	
9-11-38	13.6	33.9	27.2	
Totals	99.7	245.6	199.4	

action on the streptococci is evidenced by the fact that in addition to apparently inhibiting their appearance in the milk temporarily, the Hotis test remained negative until the concentration of sulfanilamide in the animal had been materially reduced, although the presence of streptococci in the sample was established by microscopic examination. This action consisted in a suppression of both the ability to ferment the lactose present in the milk and the characteristic flake formation on the side of the tube. When cultures of streptococci were isolated from these same samples, however, and tested in differential media, a typical reaction for *S. agalactiae* was found.

No explanation is apparent for the variation in the results of the bacteriological examination. The physical condition of the udders of the three cows was very much the same. Each animal had one quarter with extensive indurations throughout and definite areas of induration could be palpated in the remaining quarters. Streptococci were present in all four of the quarters of cow 75, and these organisms were found regularly, with one exception, in the incubated milk. Only one quarter of cow 20 was found to be infected and the results of the microscopic examination of the incubated milk were very irregular. Cow 67 had two infected quarters and no streptococci could be found in the milk samples

during the entire period of treatment. It is possible, of course, that if quarter samples of milk had been examined, the presence of small numbers of streptococci might have been detected more readily.

Although one cow failed to survive the large doses of sulfanilamide administered, the general physical condition of the other three cows remained relatively good for the duration of the experiment. There was some loss of appetite from the day after the treatment started until it stopped, at one of the three animals to show any clinical manifestations from this dosage of sulfanilamide was cow 75, the oldest animal (13 years) in the experiment. Toward the end of the period of treatment, it appeared to have a little difficulty in breathing and showed a slight general weakness.

The results of the determination of sulfanilamide in the blood and milk, together with the dosage of sulfanilamide, and the animals' temperatures during and after treatment are given in tables III, IV and

TABLE III—Cow 20. Dosage of sulfanilamide, concentration of the drug in the blood and milk, and the record of the temperatures during and after treatment.

DATE	DOSAGE OF SULFANILAMIDE (GM.)		MILLIGRAMS OF SULFANILAMIDE PER 100 CC.		TEMPERATURE, DEGREES F.	
	A.M.	P.M.	BLOOD	MILK	A.M.	P.M.
8-22-38	215	100	0	0	100.6	102.1
8-23-38	100	100	19.48	18.08	100.4	100.8
8-23-38*			21.90	20.54		
8-24-38	100	100	21.42	20.54	101.8	102.4
8-25-38	100	80	22.90	23.42	102.1	102.5
8-26-38	80	60	27.26	26.78	101.8	102.4
8-27-38	60	60	22.38	24.60	101.6	101.4
8-28-38			19.36	20.82	102.6	102.1
8-29-38			10.49	10.95	101.4	100.2
8-30-38			3.77	4.13	101.0	101.2
8-31-38			Trace	Trace	100.7	

*P. M.

which time all of the cows returned to full feed, but at no time did the animals refuse the feed entirely. Possibly as a consequence of the lowered food intake as well as the unusual amount of handling during the medication, there was a decrease of 26 to 38 per cent in milk production (table II) during the week of treatment. Two weeks later production returned to the pretreatment level or slightly higher.

In addition to the drop in milk production, there was some loss in weight during this period. Cow 20 weighed 1,180 pounds at the beginning of the experiment and 1,114 pounds when it was weighed nine days later—a loss of 66 pounds; cow 67 lost 74 pounds, dropping from 1,174 pounds to 1,100 pounds; and the third cow, number 75, also lost 74 pounds, going from 1,250 pounds to 1,176 pounds. The only

V. It is evident that an initial dose of 0.4 gm. of the drug per kg. of body weight, followed by 0.2 gm. every twelve hours, was adequate to raise the concentration of sulfanilamide in the blood and milk to the desired level of 20 mg. per 100 cc. in a short time. However, continued administration of 0.2 gm. tended to raise the concentration of sulfanilamide above the maximum level of 25 mg. per 100 cc. Consequently, the dose was reduced on the fourth day to about 0.15 gm., and still further on the fifth day to a little over 0.1 gm. Although this smallest dosage was given for only one day, it is possible that a level of 20 mg. per 100 cc. might have been maintained for some time with it.

This course of treatment did not appear to have the same effect on the temperature

TABLE IV—Cow 67. Dosage of sulfanilamide, concentration of the drug in the blood and milk, and the record of the temperatures during and after treatment.

DATE	DOSAGE OF SULFANILAMIDE (GM.)		MILLIGRAMS OF SULFANILAMIDE PER 100 CC.		TEMPERATURE, DEGREES F.	
	A.M.	P.M.	BLOOD	MILK	A.M.	P.M.
8-22-38	215	100	0	0	101.0	102.5
8-23-38	100	100	17.64	18.96	100.6	102.1
8-23-38*			20.98	22.06		
8-24-38	100	100	24.00	21.42	101.0	102.6
8-25-38	100	80	25.40	21.58	100.2	101.4
8-26-38	80	60	28.84	28.56	101.4	102.0
8-27-38	60	60	20.00	24.80	102.3	101.6
8-28-38			20.54	22.38	102.0	100.2
8-29-38			8.93	10.49	100.2	101.0
8-30-38			3.05	3.79	100.4	101.4
8-31-38			Trace	Trace	100.1	

*P. M.

TABLE V—Cow 75. Dosage of sulfanilamide, concentration of the drug in the blood and milk, and the record of the temperatures during and after treatment.

DATE	DOSAGE OF SULFANILAMIDE (GM.)		MILLIGRAMS OF SULFANILAMIDE PER 100 CC.		TEMPERATURE, DEGREES F.	
	A.M.	P.M.	BLOOD	MILK	A.M.	P.M.
8-22-38	230	120	0	0	101.0	103.0
8-23-38	120	120	22.73	21.42	100.2	101.5
8-23-38*			21.42	21.36		
8-24-38	120	120	23.42	23.08	100.8	102.0
8-25-38	120	100	24.00	23.62	99.2	100.4
8-26-38	100	80	27.76	27.26	101.0	102.6
8-27-38	80	80	20.98	23.62	103.6	102.8
8-28-38			24.40	25.84	102.0	103.2
8-29-38			10.13	11.19	101.8	104.4
8-30-38			3.75	3.32	103.4	105.2
8-31-38			Trace	Trace	101.6	

*P. M.

of these cows that had been found previously.[1] No appreciable rise in temperature occurred in cow 20 (table III) or 67 (table IV) at any time. On the other hand, there was an increase in the temperature of cow 73 (table V) on the fifth day of treatment and it remained above normal for five days, after which time no record was kept. During the time the temperature was the highest in this case, the concentration of sulfanilamide in the blood and milk had dropped to about 10 mg. per 100 cc.

DISCUSSION

It is somewhat difficult to explain the failure of sulfanilamide to cure streptococcal mastitis in this instance, in view of the fact that it proved effective in eliminating streptococci from the udder of one of two cows in a previous experiment.[1] As far as can be determined, the conditions present in the two experiments were very much alike, other than that the drug did not produce a thermic response in two animals and caused a delayed rise in the third one of the second group. Since it is believed that the presence of a high temperature at the time of a high concentration of sulfanilamide in the body enhances the therapeutic action of the drug, there is some possibility that this fact may ac-

count for the ineffectiveness of the medication in this case. In any event, it is apparent that sulfanilamide can hardly be considered to be of value in the treatment of chronic mastitis caused by streptococci.

On the other hand, the observation that sulfanilamide appears to have a transient inhibitory action on the streptococci in the udder would suggest a possible use for it in the treatment of acute attacks of mastitis due to these organisms. In such cases it would seem that resolution of the clinical syndrome should be materially hastened by a transitory suppression of the causative agents. Such therapy, however, should probably be used to supplement rather than to replace the older methods of treatment. In addition to the treatment of acute cases of mastitis there is a second possibility that early cases of streptococcal mastitis might respond to sulfanilamide therapy. A somewhat similar suggestion has been made by other investigators[5, 6] and undoubtedly merits further study. In all probability, the success of such treatment would depend largely on very early detection of the disease, before the infection has become firmly established.

In any consideration of conditions which might be benefited by the administration of sulfanilamide, the matter of the size of the dose to be employed is of importance. Whether doses as large as those which have been used in this work are necessary to accomplish the purpose, and also whether such doses are within the limits of safety, remains something of a question.

The death of one cow during the course of treatment in this experiment raises some doubt concerning the safety of the dosage employed. Although all of the cows which have been treated, with the one exception, have shown little ill effect, it appears probable that these doses approach the toxic limit rather closely. If, however, a concentration of 20 mg. of sulfanilamide in 100 cc. in the blood is required, the dose can not be reduced to any extent. As a consequence, when the drug is used, close attention should be given the patient for any untoward symptoms which might appear. What connection, if any, there may have been between the sulfanilamide therapy and infection with Johne's disease in the animal which died, is not known, but it may be of some significance that the other three animals did not react to the intradermic test with Johnin, which was applied a few weeks later.

SUMMARY

1. Three lactating cows were treated for a period of six days with large doses of sulfanilamide in an attempt to cure chronic streptococcal mastitis. A fourth cow which was included in the group died during the course of treatment. The animal was found to be infected with Johne's disease.

2. Although the streptococci were not permanently removed from the udders of these cows, there was a temporary removal of these organisms from the milk.

3. Each cow received 0.4 gm. of sulfanilamide per kg. of body weight as the initial dose, and 0.2 gm. every twelve hours for six doses. The amount was then reduced to 0.15 gm. for two doses and to about 0.1 gm. for the three remaining doses. This scaling down of the drug became necessary because of a tendency for the sulfanilamide to accumulate in the blood and milk. This dosage produced a concentration of 20 mg. in 100 cc. and above in the blood and milk which was maintained for six days.

4. The three cows which remained in the experiment showed little ill effect from the treatment, except for a temporary decrease in milk production and some loss in weight.

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Trichomoniasis in Cattle: Biological Studies and a System of Control

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THE WRITER had the privilege, during the academic years 1936-38, of taking part in a system of control of bovine trichomoniasis as a member of the ambulatoric clinic of the Munich Veterinary School, under the direction of Professor Abelein. The following report includes work done by the author as well as contributions made by others[1-4] during the campaign in upper Bavaria.

It is not intended to give a review of other previous or current work nor to furnish a description of the causative organism. Readers must be referred to previous papers dealing exhaustively with these aspects.[5-9] Some covering of old ground can not be avoided, however, in a discussion and interpretation of the results obtained at Munich.

SEAT OF INFECTION

The habitat of *Trichomonas bovis* in the female is the genital tract between the vulva and the uterus, preferably the mucous membrane in the immediate neighborhood of the external orifice of the cervix. In the male the area fortunately is more restricted. Trichomonads in infected bulls may be found in the folds and crevices of the mucosa of the prepuce and the adjoining membranes of the penis.

In the extensive researches carried out at Munich, the organism could not be found in the blood or in the urogenital tract or testes of infected animals (males), despite previous reports to the contrary.[6] By careful technic, uncontaminated ejaculates were obtained directly from the urethra of infected bulls and the absence of the organism in the tract was demonstrated. Routine examinations of male genital organs at the city abattoir confirmed these findings.

As serial blood examinations of infected animals gave constantly negative results for the presence of the organism, attempts were made to produce the disease by the introduction of pure cultures into the bloom stream of cattle known to be free of the disease. The results were negative.[3]

Acute clinical symptoms, identical with those encountered in field cases, were produced in healthy animals by transfer of pure cultures of the organism to the membranes of the genital organs. The incubation period varied from five days to three weeks. The organism proved to be strictly limited in its mode and site of infection. On this finding treatment was based.

SYMPTOMS AND LESIONS

Two subheadings are necessary here: (1) Changes arising indirectly from the presence of the organism, and (2) change due to *T. bovis* as the transmissible primary cause.

1. In an instructive experiment at Munich, Mann[4] demonstrated *T. bovis* as a carrier of bacteria. Under aseptic precautions, he filled glass tubes with cervical mucus. Within 24 hours, trichomonads carrying a known number of *Escherichia coli* had ascended 8 cm. through the mucous seal. Under normal circumstances the mucous seal of the cervix (particularly that of pregnant animals) provides an effective barrier to bacterial invasion. That this defense can be broken by trichomonads was demonstrated subsequently by inoculation of vaginal membranes of pregnant heifers. In every case, after not more than three months, abortion had taken place or pyometra was present with progressive decomposition of the fetus.[2]

In abortive cases trichomonads could be demonstrated and even be obtained in pure

culture from the fetal membranes.[1] In pyometra this is not always possible. After gaining entrance, the intrauterine distribution of the organism takes place between maternal and fetal placenta with one of the following results:

(a) The organism carries with it *E. coli* and the latter soon outnumber the primary invader. Trichomonads disappear and the course of the disease is that of coli-pyometra with persisting corpus luteum.

(b) The organism enters and no secondary invasion ensues, which carries us on to subheading 2.

2. Since the transfer of the disease is effected during service, lesions may be caused in male and female organs. The issue, however, is confused by the fact that, in the majority of cases, particularly those of long standing, macroscopic lesions are entirely absent. The organisms seem to thrive on the mucous membranes of the vagina and prepuce. If they increase too much in number, irritation sets in and the resulting inflammation and the swelling of the lymph follicles present the clinical picture.

A fresh infection of a bull results first in inflammation of the prepuce. Within a few days there is a decided swelling and hyperemic condition of the mucosa. This is followed by a more or less profuse mucopurulent discharge. The animal exhibits pain and often hesitates to serve. At this stage, evenly distributed nodules appear on all affected membranes right up to the tip of the penis. These nodules are of millet to lentil size.

The acute inflammation usually subsides within a week or two. The color and condition of the mucosa return to normal, except for the nodules, which persist for some time. They lose their deep red color, first in the center and later become quite gray. After several weeks, they are detected with difficulty. While trichomonads are easily demonstrable during the acute phase, they are not as easily found later. The animal remains infective.

In the cow the symptoms depend on the age of the animal and the stage of infection of the bull at the time of service. Heifers and young cows are more prone to get the acute form of the disease than older ones. A bull in the acute stage of the infection transmits a more acute form of the disease. Any of the following conditions may result:

1. Within three days after service, a mucopurulent discharge from the vulva will be observed. Acute vaginitis and vestibulitis, with swelling and uterine catarrh, ensue. The mucosa of the vestibulum, in its congested condition, and the appearance of nodules are very similar to the analogous state in the bull (Abelein's "rasp" formation). Conception is prevented by uterine catarrh. Soon the acute symptoms subside, except for a slight uterine catarrh, which persists with occasional watery discharges, which reveal the presence of trichomonads. After several subsequent failures to obtain conception when served, the owner decides to take the animal to another sire when next in heat.

2. There may be absence of any recognizable symptoms after service. Months later, maceration of the fetus and pyometra with persisting corpus luteum are found by rectal examination. The vagina appears normal. The cervix remains sealed.

3. There may be total absence of symptoms after service. The cervix, however, opens later, either in periodic spasms or permanently. Quantities of thin, yellow-gray, pea soup- or egg soup-like purulent discharge are emitted. The discharge also may be clear and watery. The owner is often not worried until he sees the discharge too often or, by chance, a large amount of it.

4. No apparent symptoms occur after service. Conception takes place in spite of infection. After 14 to 30 days, a watery discharge appears, immediately followed by abortion. This often happens in the absence of the owner and is never recognized. The estrus then becomes regular again and, after further service, a state of repetition ensues, closely resembling nymphomania.

In a number of cases where a watery discharge and subsequent abortion take place, or where the cervix remains closed and the fetus undergoes maceration, trichomonads

in pure culture are obtained. In these cases a true metritis does not exist. No pus is present. The animal seems to show no ill effects. A state of pregnancy is maintained by the persistence of the yellow body, and the trichomonads, having deprived the fetus of its proper contact and nourishment, continue to thrive in the medium supplied by the carunculae of the uterus. The writer experienced one case where this state had persisted for twelve months. Evidence of the presence of a fetus, in this particular case, was a knotty, stringy mass, found after treatment in the aborted fluid.

DIAGNOSIS

It is obvious that, with the variety of symptoms described above, attention must be given to the general history of a herd. Carefully placed questions as to general fertility, frequency of early abortion or occurrence of vaginal discharge, may yield valuable information. Where the disease is suspected, it is of primary importance to locate the sires of the herd. Their genital organs should be subjected to as close an examination as possible without epidural anesthesia, and a sample of secretion of the prepuce should be examined microscopically for trichomonads. A catheter for taking samples of uterine mucus aseptically can be used for the purpose to advantage (H. Hauptner, No. 42,951). If there seems to be no evidence of organisms in the sample, it must not be concluded that infection is not present.

Where anatomical lesions and symptoms are exhibited, these necessarily affirm diagnosis, but in the majority of cases they are absent. Any vaginal discharge warrants microscopic examination and if trichomonads are present, the sire of the herd must of necessity be infected too, if there has been sexual contact. In the diagnosis of this disease, the veterinarian must be sure of his ability to diagnose pregnancy in its early stages. To those with some experience, rectal palpation of a two-month pregnancy should not present much difficulty. Examination per rectum will also reveal pyometra. The vagina and cervix should not be directly palpated before examination per rectum has been finished.

In summing up, it may be said that sporadic abortion, frequent vaginal discharges, pyometra or reports of persistent sterility warrant suspicion of trichomoniasis, although possible differential diagnoses, such as brucellosis, uterine catarrh, tuberculosis, infectious vaginal vesiculitis, functional sterility due to ovarian cysts, and glandular or anatomical maladjustment must be considered.

TREATMENT

In order to establish an effective system of control, in no case should an infected bull be permitted to serve animals, regardless of whether they are healthy, suspects, or known to be infected. Breeding operations must be stopped in order to combine curative and preventive treatment. The herd must be sorted into (a) noninfected cows and virgin heifers, (b) positively pregnant cows, and (c) infected cows, those with pyometra or other symptoms of the disease, and the infected sire or sires. These groups need not be segregated in different barns, since in our experience the disease is not transferred from cow to cow except by service. The causative organism is delicate and exacting in its environmental requirements and difficult to culture from samples of mucus sent to the laboratory. It it unlikely that it would retain sufficient viability to infect other animals once outside the body.

Group A, after careful examination, may be served by a sire which has been declared free of the disease. Group B is kept under observation for potential pyometra cases. Group C receives curative treatment. In pyometra cases the treatment begins with enucleation of the corpus luteum. Within 48 hours, the cervix should open and there should be a purulent discharge from the uterus. During the next three to four days, at least once a day, a thorough vaginal douche, with a 5 per cent solution of sodium perborate, should be given. After this, 100 cc. of a 1 per cent solution of iodine in potassium iodide is injected carefully through the cervix. This is accom-

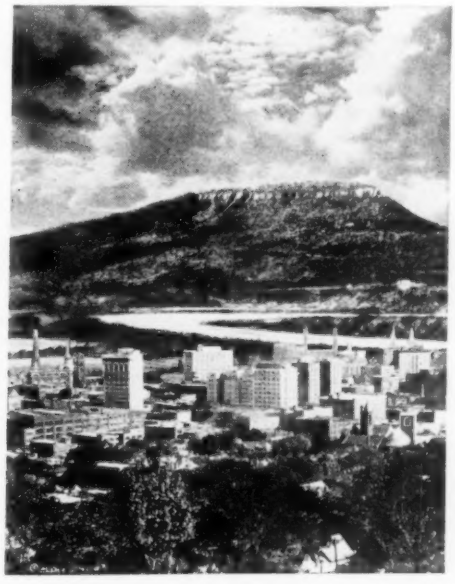
plished most effectively with a 100-cc. pressure syringe, to which a uterine catheter has been adapted.* The Munich technic is as follows: Introduce the right hand into the rectum and with firm grip fix the cervix near the outer orifice. The left hand then introduces the catheter into the vagina and, with gentle pressure, the cervical orifice is approached and entered. The syringe is now pumped empty without pushing the catheter through the whole of the cervix. The right hand keeps the cervix fixed throughout the performance. This technic requires some skill and it is recommended that the novice should not use it, but rather bring back the cervix with Neilson's forceps for the purpose of introducing the catheter. After the expulsion of the iodine solution has ceased, a few more sodium perborate douches for the vagina are prescribed. In the enucleation of the yellow body by pressure, we must reckon with a mortality of 2 per cent. The fact should be impressed upon the owner that the possible loss of the animal is preferable to harboring the infection in his herd.

Statistical figures gave the percentage of success of the iodine treatment after enucleation as between 70 and 80 in trichomonad pyometra. (Pyometra post partum has a tendency to respond more slowly to treatment.) Hot douches or oral medication of abortive drugs as alternative treatment of pyometra have not gained popularity. A report has just reached the writer that the subcutaneous injection of 30,000 to 40,000 units of "provetan" has been used successfully in replacing enucleation.[2] Spontaneous recovery from the infection after an abortion early in gestation seldom or never takes place. Such apparently normal animals, which often fail to exhibit the organism in their mucus samples, were found to infect bulls during service if no treatment had been given. Iodine treatment should be given to all known or suspected cases of abortion.

In cows in which no uterine involvement is present, a persistent treatment with 5 per cent perborate douches suffices to clear the infection. When the next estrus has set in, the animal is examined for the presence of trichomonads and, if negative,

*A catheter, "4321m," introduced in Germany for obtaining samples of mucus aseptically from the prepuce and uterus, was preferred to the so-called Neilson's forceps.

A Point of Interest on the Road to Memphis



Veterinarians living in the Northeast who take the A.V.M.A. Special (shown above) to the Memphis meeting will have an opportunity to visit Lookout Mountain (right) in Chattanooga, Tenn. Information concerning the time schedule and rates may be obtained from G. M. Lawrence, General Eastern Passenger Agent, Southern Railway System, 500 Fifth Ave., New York, N. Y.

allowed to be served at the subsequent estrus. In an infected herd it is best to treat all nonpregnant cows in this manner. Sexual rest alone, over two or three estrual periods, does not eliminate the infection and animals "cured" in this manner often serve as new foci of infection.

We have found sodium perborate an exceedingly helpful vaginal disinfectant by virtue of its peculiar power to penetrate into mucous depths and its safety in use. No harm will be caused should it be applied in higher concentrations than specified. Solutions must be made immediately before use. Douching of male or female organs with disinfectants of any kind before and after service is not advocated. In our experience the value of such procedure is extremely doubtful, unless high concentrations are used, and these are harmful to sperm.

Bulls may be treated and cleared of the infection. It is well, however, before attempting treatment, to make sure that the value of the animal warrants it. Sires, at the end of their career or of declining value for other reasons, are best eliminated *via* the abattoir. The procedure of treatment is as follows: If there be enough space available in the barn around the usual stall of the animal, it is best to choose that place. Otherwise any shed or, if weather permits, a place in the open will do, where the animal will not be molested while recovering from the epidural anesthesia. In all cases good bedding must be provided.

An excellent and simple rig was devised by Abelein to bring the animal down upon the haunches and chest. It consists of an adjustable belt, ten inches wide, with two rings securely riveted above each other on either side. The belt is adjusted around the posterior thorax in a manner that places the rings in lateral position to the left and right ribs. It is tightened firmly and secured by a large buckle. The upper ring serves as a pulley for the rope coming from the hobble of the hind foot and the lower ring for the rope from the fore foot. Four separate ropes are used instead of the usual single one in casting.

The animal is anesthetized and, when ready to fall, is cast by a strong, simultaneous pull on all ropes. As all legs are flexed thus individually, no further adjustment is necessary when the animal is rolled onto its side or brought into dorsal recumbency. In over 200 cases, not a single injury was experienced in casting animals weighing from 600 to over 2,200 pounds. For epidural injection, a 1 per cent tutocaine solution, at body temperature, was employed, 7 cc. per 100 pounds of body weight of the animal. This will effect complete paralysis of the hind quarters and the necessary relaxation of the retractor penis.

With the patient in operating position, the hair at the prepuce opening is shorn and the penis unsheathed. In a number of cases it is necessary to employ suction into a glass tube of corresponding diameter to bring the penis forward. While an assistant firmly holds with a clean towel the distal part of the penis, the whole mucosa of the prepuce is exposed by gentle pulling. The operator, using rubber gloves, smooths out the membranes and systematically, with gentle pressure, thoroughly massages into them 75 to 100 cc. of a 0.5 per cent trypaflavin salve.

Particular attention is paid to the many folds and crevices near the opening of the urethra. The ointment is applied uniformly without rubbing too vigorously, the whole procedure lasting at least ten minutes. A catheter is then introduced into the urethra for two to three inches and 30 cc. of a 0.1 per cent trypaflavin solution is injected. The use of higher concentrations should be avoided, as it has been found that 0.2 per cent trypaflavin causes a severe urethritis. The penis is now resheathed and the opening of the prepuce well covered with salve and tied with a string to prevent unsheathing. When anesthesia has completely worn off, the string is removed. After a week to ten days, the treatment is repeated.

A few additional remarks may be in order, to avoid unpleasant incidents. To keep the animal from throwing its head about when cast and possibly breaking off a horn, the nose should be held firmly to

the ground. After treatment, it is a good rule to keep the animals restrained for several hours to prevent dangerous attempts to rise before full control of their hind limbs has been restored. Examination at the second treatment will reveal fibrinous deposits or patches covering the mucosa. These are easily removed and their formation seems of no serious consequence. Before the owner can be assured that the disease is eliminated, a herd should have had three thorough examinations. The second one should take place approximately six weeks after the first, when enough time has elapsed to diagnose pregnancy in all cows mated up to the time of the first examination. All pregnant cows should be reëxamined. By then the bull will have received treatment and a sample is again taken of the preputial secretion for microscopical study. The third examination should follow three to four months after the first visit, and one should make certain that all of the treated animals are still free of the organism. It is well to pay herds a visit quarterly thereafter for general sterility control, such as advice concerning proper and economical feeding, examination for healthy sperm, genital disorders in the herd, and Bang's disease and tuberculosis check-up. The efficiency of reproduction will soon convince farmers of the advantage of such service.

SUMMARY

1. Trichomoniasis is a sexual disease in cattle transmitted only by coitus. The causative organism, *Trichomonas bovis*, does not enter the circulatory system of either sex or the urogenital tract of males.

2. Symptoms vary greatly and diagnosis must rely on history and microscopy where symptoms are absent.

3. The disease may be eliminated by proper treatment.

ACKNOWLEDGMENT

The writer wishes to express his gratitude to Professor Abelein for unfailing assistance during the course of this work in Germany.

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Compound Fracture

The patient with a compound fracture should receive a dose of tetanus antitoxin; an intravenous injection of saline dextrose; an accurate x-ray examination after shock is passed; and as little anesthetic as possible. Muscle tissue should be trimmed down to the bleeding point, dirty bone ends snipped away sparingly with the rongeur, and the wound searched for foreign bodies and loose bone fragments. *(Gaza DeTakats, M.D., Clinical Medicine and Surgery, Chicago, xlv (Aug., 1938.)*

Chloral-Magnesium Anesthesia

Magnesium sulfate combined with the chloral hydrate given intravenously for anesthetic purposes is an improvement over chloral alone. The preferred dose is 10 gm. of magnesium sulfate and 10 gm. of chloral for each 100 kg. of body weight in an aqueous solution of 1:10 to 1:20.

The magnesium hastens the appearance of the anesthesia and increases its depth, and reduces to the minimum the toxicity of the chloral. Its "decongesting" properties favor diuresis and the elimination of toxins and, in particular, prevent pulmonary complications.

This anesthesia does not provoke any harmful modification of the pulse, temperature, respiration, coagulability of the blood, or leukocytic defense. *(Abstract from Revista Veterinaria militara in Recueil de Médecine Vétérinaire, cxv (April, 1939), p. 336.)*

The Rôle of the Avian Tubercle Bacillus in the Sensitization of Cattle to Tuberculin*

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TUBERCULOSIS of fowls constitutes one of the most important animal disease problems confronting veterinarians in the north central area of the United States. The direct and indirect consequences of this disease are responsible for incalculable losses both to the swine and poultry industries, which losses are ultimately paid for by the consumers of swine and poultry products. A survey of the situation indicates that the occurrence of tuberculosis infections in heterologous hosts is a problem that can never be solved until the tuberculous poultry flock is eliminated, and this task now confronts all live stock sanitarians.

The notable achievement of American veterinarians in reducing bovine tuberculosis to a negligible minimum has incited the admiration, and I might say the envy, of physicians, who are still waging a militant fight against tuberculosis of human beings. Many of our European colleagues are astonished by the fact that we have all but succeeded in eradicating tuberculosis of cattle. Many were frankly skeptical when the work began, and some said it could not be accomplished. The task, however, is nearly finished and the accomplishment of what many said was impossible should give us confidence to believe that tuberculosis in our American poultry flocks can also be controlled and perhaps likewise reduced to a negligible minimum.

TUBERCULIN SENSITIVITY

To the student of tuberculosis the ability of the tubercle bacilli to produce within the tissues of an affected animal a state of sensitivity to the product known as "tuberculin" constitutes an intriguing and unique phenomenon. On this phenomenon, which was first observed by Koch in 1891, is based one of the most useful diagnostic procedures available to the physician and to the veterinarian. Without the tuberculin test it is difficult to believe that the present satisfactory status of bovine tuberculosis in the United States could have been obtained. Yet in spite of the truly remarkable results that have been achieved in the control of bovine tuberculosis through the instrumentality of the tuberculin test, there have occurred with increasing frequency instances in which positive reactions could not be satisfactorily explained either by the demonstration of tuberculous lesions or by the presence within the herd of definitely tuberculous animals.

Such instances are a source of much confusion to sincere believers in the specificity of the tuberculin test and they give the critical, and frequently biased, layman evidence to support the point of view that the tuberculin test, if not entirely useless, is of only limited value. Whatever interpretation one may have for that group of cattle conveniently classified as "nonvisible lesion reactors," all will agree, I believe, that such cattle constitute a very definite problem and one which must eventually be solved if the owners of cattle are to be convinced that removal from the herd of reactors is in all instances justified.

From the title of this paper it might be construed that a thorough study of the problem has been made and the part, if any, that the avian tubercle bacillus plays in the problem of the sensitization of cattle to tuberculin has been established. This is not the case. Although the problem has been studied rather extensively for several years by Plum in Denmark, it has not as yet been studied comprehensively in America and any conclusions that may be drawn

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concerning the rôle of the avian tubercle bacillus in the sensitization of cattle are based, at least in part, on presumptive evidence.

Sensitization of an animal to tuberculin presupposes that tubercle bacilli are or have recently been present within the tissues and that morphological alterations have ensued. In other words, it is difficult to accept the hypothesis that without tissue alterations or lesions, tubercle bacilli can passively invoke a state of sensitivity to tuberculin. The morbid changes may be marked and extensive, or they may be minimal and extremely difficult or even impossible to demonstrate.

These variations in the severity of infections with tubercle bacilli can be demonstrated experimentally in a variety of species of animals, some of which are extremely susceptible to tuberculosis and some, highly refractive. As a simple illustration, the susceptibility of the rabbit to infection with tubercle bacilli will suffice. The rabbit has but slight resistance to the bovine form of the tubercle bacillus and, when a rabbit is given an intravenous injection of this organism, the results are lethal. Extensive and striking tuberculous changes ensue, death occurring in most instances in from four to six weeks after inoculation.

Rabbits injected with the human form of the tubercle bacillus seldom die as a consequence of tuberculosis. When such animals are examined months after inoculation, the disease may be limited to an occasional tubercle in the liver or spleen and lungs or, infrequently, it may be impossible to demonstrate any lesions at all. Although the severity of the morbid changes induced in the rabbit by the bovine and human forms of the tubercle bacillus are strikingly dissimilar, a comparable sensitivity to mammalian tuberculin is usually manifest, regardless of which of the two forms of the organism mentioned was injected. Thus is illustrated the fact that the degree or severity of the local reaction to tuberculin injected intradermally bears no relation to the extent or severity of the tuberculous changes which provoked the state of sensitivity.

I have no intention of denying the possible rôle of heretofore unrecognized forms of acid-fast bacteria in the sensitization of cattle to tuberculin. It is my belief, however, that until convincing information is available on the ability of other than true tubercle bacilli to produce a state of sensitivity, we shall occupy a firmer position by continuing to believe that, in the majority of instances, a positive reaction to tuberculin is indicative of a sensitivity which has developed as a consequence of the bovine, the human, or the avian tubercle bacillus.

With this premise established let us now examine the evidence concerning the natural and experimental infection of cattle with the avian tubercle bacillus and the ability of this member of the genus Mycobacterium to provoke a state of sensitivity to tuberculin in bovine animals.

INFECTIVITY OF AVIAN TUBERCLE BACILLI FOR HETEROLOGOUS HOSTS

The ability of the bacillus of fowl tuberculosis to set up a severe and aggravated disease in heterologous hosts is not always appreciated. It is generally recognized, of course, that swine are readily infected by this organism, which usually produces nonprogressive localized lesions in the lymph nodes along the alimentary tract, yet it was shown only recently that the avian tubercle bacillus was responsible for most of the cases of generalized tuberculosis of swine studied in a certain slaughtering establishment in southeastern Minnesota.[1] Furthermore, the comparatively recent studies of Roderick and his associates[2] in North Dakota have demonstrated convincingly the pathogenicity of the avian tubercle bacillus for sheep.

The severity of the lesions produced in sheep infected naturally with avian tubercle bacilli is frequently of striking proportions and demonstrates in an impressive manner the pathogenic propensities of avian tubercle bacilli for a heterologous host. Aside from the reports of Plum of Denmark, the occurrence of avian tubercle bacilli in the tissues of cattle has not often been re-

ported. Although the total number of reported instances is not large, sufficient information is available to establish the fact that these bacteria may find residence in the tissues of cattle where they may be responsible for at least minimal lesions and cause a sensitization not only to avian tuberculin but also in some instances to mammalian tuberculin.*

A partial summary of the reported instances in which avian tubercle bacilli have been obtained from the tissues of cattle is given in table 1.† It can not be said that the instances reported constitute an impressive total. The meagerness of the data suggests, however, the desirability of additional investigations with methods that are adequate to demonstrate the avian tubercle bacillus. In this regard it should be pointed out that, in procedures utilized to determine the tuberculous character of obscure tuberculous infections in cattle, the usual practice heretofore has been to inject only guinea pigs.

Since guinea pigs are essentially not susceptible to the avian type of infection, it is obvious that the results from such tests will usually be unsatisfactory, if depended upon for the diagnosis of infections due to avian tubercle bacilli. If animals only are to be used in demonstrating obscure instances of tuberculosis in cattle, rabbits as well as guinea pigs should always be used. If this practice is followed and if an extensive investigation of the problem is made, it is not unlikely that a considerable percentage of so-called nonvisible lesion reactors, from regions where avian tuberculosis is prevalent, would yield avian tubercle bacilli.

In considering the natural infection of cattle with avian tubercle bacilli, it is of interest to note that certain European investigators, particularly Plum[3] of Denmark, have succeeded in demonstrating avian tubercle bacilli in association with intra-uterine infections in cattle. Plum has stated that the pregnant uterus of the cow appears to be the site of predilection for avian tubercle bacilli and that, when these bacteria invade the uterus, they are capable of producing abortion. At present there is no proof that the avian tubercle bacillus is a factor in abortion disease of cattle in the United States. It must be admitted, however, that there are no reports to indicate that the problem has been investigated sufficiently to justify the conclusion that intra-uterine infection with avian tubercle bacilli does not occur in cattle in the United States. This problem is worthy of serious study.

Apropos of the pathogenicity of avian tubercle bacilli for cattle, the question of the experimental infection of bovine animals should be mentioned briefly. A considerable number of investigations have been reported and, while the results have not always been consistent, sufficient data have accumulated to enable one to obtain a fairly definite idea of the problem. The following facts seem to have been established: (1) Cattle can be infected experimentally with avian tubercle bacilli; (2) the extent and severity of the disease depend on the age of the animal, the route of inoculation, and the virulence of the particular strain used; (3) avian tubercle bacilli, when injected intravenously, usually induce a severe disease which is often lethal; (4) when cattle are inoculated subcutaneously, they tolerate the infective agent well in most instances, the disease usually being limited to the area of injection and to the regional lymph nodes; (5) following the ingestion of avian tubercle bacilli by cattle, lesions are usually established in the lymph nodes of the alimentary canal and lesions may develop in the intestinal mucosa; and (6) exposure of cattle to avian tubercle bacilli results in most instances in the development of sensitivity to avian tuberculin and, in some instances, to mammalian tuberculin.

SENSITIVITY TO HOMOLOGOUS AND HETEROLOGOUS TUBERCULINS

Having established, therefore, that cattle can be and sometimes are infected with

*Plum[3] has reported the occurrence of lesions in the lungs and in the pleura and peritoneum of cattle naturally infected with avian tubercle bacilli.

†Additional details concerning the pathogenicity of avian tubercle bacilli in cattle may be found in the writer's monograph, "Avian Tuberculosis Infections." (Williams & Wilkins Co., Baltimore, 1938.)[4]

TABLE I—Partial summary of instances in which avian tubercle bacilli were demonstrated in the tissues of naturally affected bovine animals.

REPORTED BY*	YEAR	NUMBER OF CASES	COMMENTS
Kruse	1893	1	Confirmed by Pansini
Pansini	1894	1	Not conclusive
Johne and Frothington	1895	1	Lesions atypical for bovine type of infection
Bang	1908	1	Organism isolated from bronchial lymph node
De Jong	1910	1	Organism obtained from lung of calf
Griffith	1928	1	Organism from a caseo-calcareous lesion in mesentery lymph node of a calf
Van Es and Martin	1930	11†	Material from 164 animals was studied. Lymph node material was examined in most instances
University of Illinois	1930	5‡	Organisms obtained from localized lesions of lymph nodes
Hastings, Wisnicky, Beach and McCarter	1933	1	Organism obtained from lymph node tissues of nonvisible lesion reactors
Feldman and Schlotthauer	1935	3	Material from eleven animals that had reacted to tuberculin was studied
Crawford	1936	1	Organism obtained from one of seven cattle from the Island of Guernsey
McCarter, Hastings and Beach	1937	3	Twenty-eight cattle that had reacted to tuberculin were studied
Minett	1932	5	Material obtained from three calves and two adult bovines
Glover and Griffith	1935	3	Lesions nonprogressive and calcareous
Plum	1937	57	Lesions mostly in mesenteric lymph nodes

*Bibliographical data pertaining to the respective authors will be found in chapter 10 of the monograph by Feldman.[3]

†There were four additional cases in which both avian and mammalian tubercle bacilli were present.

‡The report stated that the avian tubercle bacillus was obtained in approximately 10 per cent of the 50 calves examined.

avian tubercle bacilli, I will next examine the evidence concerning the ability of this bacterium to sensitize cattle to avian and mammalian tuberculins. The problem is extremely important and, until it is better understood, certain difficulties in the interpretation of the intracutaneous tuberculin test may be expected.

Although it has been definitely shown by several investigators that cattle will usually become sensitized to avian tuberculin following their exposure to avian tubercle bacilli—either in an infected environment or by experimental inoculation—the reports available indicate that the reaction to mammalian tuberculin is inconstant. In this regard the work reported from North Dakota by Schalk, Roderick, Foust and Harshfield[2] is especially noteworthy. They found, for example, that 75 per cent of 33 young adult cattle that had been in an infected barnyard for several months reacted to avian tuberculin, whereas only one of the animals reacted to mammalian tuberculin. At necropsy none of the animals had well marked lesions of tuberculosis.

In another experiment, in which 18 cattle were kept in association with tuberculous chickens, well marked positive reactions to avian tuberculin occurred in nine of the cattle and none of the animals reacted to mammalian tuberculin. As in the first-mentioned experiment, no well defined lesions of tuberculosis were found in any of the cattle, although from the lymph nodes of three of them avian tubercle bacilli were demonstrated. Attempts also were made to sensitize cattle to mammalian tuberculin by feeding them large amounts of tissue from tuberculous chickens or by introducing avian tubercle bacilli into the scarified skin or conjunctival sac. Although a large number of cattle were used in these experiments and sensitivity to avian tuberculin occurred in a large percentage of cases, in no instance was sensitivity to mammalian tuberculin observed.

Another group of cattle, which presumably had originated from farms where

the existence of tuberculous poultry was likely, was injected with avian and mammalian tuberculins simultaneously. Of the 507 animals injected, 79, or 15.6 per cent, reacted positively to avain tuberculin, whereas only two reacted positively to mammalian tuberculin. One of the two latter animals reacted also to avian tuberculin.

From the results of their observations, which are given here only in part, Schalk *et al* concluded that a positive reaction to mammalian tuberculin, as this product is applied in the routine testing of cattle, in animals without demonstrable gross lesions of tuberculosis can not be explained on the basis of a previous exposure to avian tubercle bacilli. Although the data obtained by these observers adequately support this conclusion, there are reports by other workers which are at variance with the results reported by these North Dakota workers. For example, Van Es and Martin[6] obtained avian tubercle bacilli in about 10 per cent of the cases in which there were lesions of naturally acquired tuberculosis. Most significant in this connection is the fact that of the eleven cattle in which avian tubercle bacilli were demonstrated, six had been sent to slaughter because of positive reactions to mammalian tuberculin. One of the animals was considered a non-reactor and the sensitivity to tuberculin of the remaining four was not known. McCarter, Hastings, and Beach,[7] and Schlotthauer and the writer,[8] have also demonstrated avian tubercle bacilli in bovine animals that had reacted positively to mammalian tuberculin.

By far the most impressive contribution to the subject of whether or not avian tubercle bacilli will sensitize cattle to mammalian tuberculin injected intracutaneously is the recent report of Plum on work done in Denmark. In 170 cases of tuberculosis of cattle in which the type of the tubercle bacillus responsible for the lesions was determined by the cultural characteristics of the bacteria and the injection of guinea pigs, avian tubercle bacilli were demonstrated in 57 animals.

The protocols showed that bovine tuberculin had been administered to 32 and that a positive reaction was recorded for 28, whereas for four of the animals the results of the test were negative. It should be mentioned, however, that although the reactions recorded for the 28 animals were of sufficient magnitude to enable the veterinarian to record the reaction as positive, the size of the local reaction as recorded by Plum seems to have in most instances been much inferior to the typical positive reactions to mammalian tuberculin with which we are familiar in the United States. Perhaps we have been overlooking what may be an indication of the avian type of infection by failing to take cognizance of small, or what we consider insignificant, reactions to mammalian tuberculin in herds where bovine tuberculosis is not likely to be present but in which there exists exposure to avian tubercle bacilli.

In Denmark, the possibility of reactions to mammalian tuberculin being due to sensitization by avian tubercle bacilli is recognized as of sufficient importance to be considered in an official state regulation. This provides for the retesting of animals, in which the avian tubercle bacillus is suspected of being the sensitizing agent, with avian and bovine tuberculins injected intracutaneously in separate areas simultaneously. If the retest is done within 1½ or two months after the first test, the type of the infective agent should be indicated by the tuberculin that elicits the most pronounced reaction.

Plum admitted that the interpretation of the reactions in such a procedure is confusing to some, but that when done by one familiar with the history of the herd and possessed of adequate experience, the second test will generally indicate whether or not the avian or the bovine tubercle bacillus is responsible for the state of sensitivity. The data presented by Plum seem to justify this conclusion, since in 170 cases the results of the second tuberculin test and the results of the typing experiments showed a satisfactory correlation.

Whether or not we in the United States would be justified in following the Danish procedure and retesting with both avian

and mammalian tuberculins is, of course, a subject about which there is much difference of opinion. Since we have subscribed to a program that we hope will eventually eliminate from our cattle all tuberculous infections, regardless of the type of tubercle bacillus, our point of view is probably at variance with that maintained in certain other countries where it may suffice to know that an animal is not affected with the bovine bacillus. However, we are not infrequently confronted with local tissue reactions following the injection of mammalian tuberculin that are extremely difficult to interpret with confidence, and it may be reassuring at times to know that avian tubercle bacilli may be responsible for the sensitivity.

CONCLUSIONS

From a summary of the facts reviewed concerning the ability of the avian tubercle bacillus to infect cattle and to sensitize bovine animals to tuberculin, the following conclusions may be drawn:

1. The avian tubercle bacillus has a limited pathogenicity for cattle. When lesions occur, they are in the majority of instances small, localized, and nonprogressive. Instances in which the disease was generalized have not been reported.

2. Under conditions of natural exposure the lymph nodes of the alimentary canal are the sites of predilection for the avian type of infection in cattle.

3. Lymph nodes that appear grossly to be without morbid changes may, by suitable laboratory procedures, yield avian tubercle bacilli.

4. Following natural or experimental exposure to avian tubercle bacilli, most cattle develop sensitivity to avian tuberculin. In cases of natural exposure this sensitivity is usually transitory and eventually disappears if the animals are moved to a noninfected environment.

5. Occasionally, cattle sensitized under natural conditions will react rather typically to mammalian tuberculin. Plum's observations suggest that a definite reaction, but of substandard dimensions, occurs in the majority of cattle that harbor avian tubercle bacilli.

6. It seems not unlikely that in the United States the avian tubercle bacillus sensitizes more cattle to mammalian tuberculin than is generally recognized, and the possibility is suggested that at least some of the so-called nonvisible lesion reactors react to mammalian tuberculin as a consequence of sensitivity induced by avian tubercle bacilli.

7. In areas where tuberculosis of fowl is prevalent and the infective agent exists in excessive concentration, sensitivity due to the avian tubercle bacillus should be seriously considered in reacting cattle from herds in which it is reasonably certain that infection with bovine tubercle bacilli has not occurred.

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Phenol in Epizootic Abortion

In Switzerland, where the government is carrying out a campaign against epizoötic abortion, the use of both living and killed vaccines is strictly prohibited. The latter, however, are permitted in herds having more than 70 per cent of infected animals. These rigid regulations have led practitioners to employ nonspecific measures, among which is the use of phenol subcutaneously —an old remedy recommended by Brauer of Germany in 1884.

The Use of the Incubating Egg as a Differential Medium*

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THE ISOLATION of *Brucella abortus* from milk by means of an artificial medium is often difficult because of an overgrowth which may be produced by other organisms originating in the udder. For this reason it is desirable, when culturing milk for *Br. abortus*, to use a medium which will either inhibit the growth of such organisms or completely destroy them.

The guinea pig is recognized as the most satisfactory medium for this purpose. Because of the expense and the time consumed by this method, it was decided to test the possibilities of using the incubating egg for the isolation of *Br. abortus* from milk. Goodpasture and Anderson[1] have already reported that this organism will grow on the chorioallantoic membrane of the chick embryo.

We have studied the response of the chick embryo and its membranes to various dosages of *Br. abortus* and *Streptococcus agalactiae*, the latter organism being the one most commonly found in aseptically drawn cow's milk. The organisms inoculated were suspended in either physiological saline or in sterile milk. The cultures had been carried on artificial media for some time. All eggs were inoculated through the natural air sac into the chorioallantoic membrane on the tenth day of incubation. The eggs were cultured on potato agar which was prepared as recommended by Dr. J. M. Buck of the Animal Disease Station at Beltsville, Md.

We have been able to recover *Br. abortus* from the chorioallantois, liver, spleen, and brain of eggs inoculated with a saline suspension of a pure culture containing approximately six organisms. The work has also shown that the chick embryo, when inoculated after ten days of incubation, possesses sufficient bactericidal powers to enable it to destroy approximately 50,000 organisms of the strain of *S. agalactiae* which we used.

When eggs were inoculated with a saline suspension containing this number of *S. agalactiae* and enough *Br. abortus* to infect the embryo and its membranes, it was possible to recover *Br. abortus* in pure culture from the chorioallantois, liver, spleen, and brain of most of the embryos that lived for five days or more following inoculation. Most of the embryos given this dosage lived the necessary period. Our work also indicated that approximately the same results may be obtained when the organisms are suspended in sterile milk.

We have used this method for the examination of milk from an udder which is infected with *Br. abortus* and which is also heavily infected with *S. agalactiae*. In each trial, 35 cc. of the infected milk was drawn for the inoculation of four to five eggs. Six-tenths cc. of the cream and sediment from this milk was inoculated into the membranes of each egg. The membranes, spleen, liver and brain of the dead embryos and from the embryos which were killed on the 18th day of incubation were cultured on potato agar. We have recovered *Br. abortus* in pure culture from one or two eggs in six out of seven trials. In a recent test, eleven eggs were inoculated with milk from the above mentioned udder. These eggs were cultured on bacto tryptose agar containing a 1:700,000 concentration of crystal violet. *Br. abortus* was recovered from ten of the eleven eggs.

The results of our work lead us to feel that the incubating hen's egg may offer a more economical and a faster medium for the study of the occurrence of *Br. abortus* in milk.

*Journal Series paper of the New Jersey Agricultural Experiment Station, department of dairy husbandry and department of poultry husbandry.

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Lesions of Hog Cholera: Their Frequency of Occurrence *

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THE PATHOGNOMONIC significance and diagnostic value of a pathologic change depends to a large extent upon the frequency of its occurrence. Where a particular morbid change is found to occur in a high percentage of animals which have died of a specific disease, it then becomes a change characteristic of that disease. In most descriptions of the postmortem findings in swine dead from hog cholera, one or more lesions are usually emphasized as being characteristic of the disease, and their presence constitutes a significant and valuable diagnostic criterion. The basis for such statements is seldom supported by evident statistical data. However, in some cases at least, the conclusions reached represent the experience and knowledge of competent scholars and observers.

On the premise that a record on the frequency of occurrence and distribution of pathologic changes observed in swine stricken with hog cholera would be helpful to the problem of swine diseases in general and hog cholera in particular, a statistical study of the facts was undertaken.

MATERIAL FOR STUDY

Pertinent to a study of this kind are the source and nature of the material. Three hundred and fifty-four cholera-affected swine are included. They can be conveniently divided into two general groups, a series comprising 48 cases of hog cholera that were artificially induced (series A) and a second series of 286 cases that had contracted and developed the disease under natural or field conditions (series N).

Series A comprises cases of hog cholera that were produced and used in connection with investigations of this disease. All were vigorous and healthy when infected with material (blood) which we knew contained virulent hog-cholera virus. That they were susceptible to hog cholera is shown by the fact that all developed a syndrome typical of the disease as it generally occurs under artificial conditions. Most of the pigs were destroyed when *in extremis* and the autopsy was performed shortly thereafter. Destruction was produced by cannula bleeding. An average of 9.8 days elapsed from the time of infection (2 or more cc. of virulent blood serum was injected intramuscularly) to the time of destruction. The shortest period that elapsed was five days and the longest, 20 days.

The virus used for infecting seven of the pigs in this series was the regular virus which is distributed for use in connection with the serum-virus treatment against hog cholera. Cholera-sick swine that had been submitted to our laboratory for examination were the source of the virus used in 19 cases. In all these cases the plasma or serum was filtered through either Berkefeld or Seitz filters before injection. The virus used in the remainder of this group had been passed one or more times through other susceptible pigs.

The cases of hog cholera comprising series N were selected from a large number of swine that had been submitted for examination during the past 20 years. The selection was restricted to cases where the entire body was available for examination, and it was further limited to only those cases in which there was no obvious evidence of some associated or complicating infectious swine disease. Many of the animals in this series were living when they reached the laboratory. Most of them were in the advanced stage of the disease. Of the carcasses received and included in the series, only those that could be inspected satisfactorily were used. The proportion of living to dead specimens was approximately 2 to 1.

While the basis for the ultimate diagnosis of the disease in this series was the

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postmortem findings, nevertheless in most instances there were certain other factors which could be taken into consideration as supporting evidence. Relatively complete herd histories were available for a great many of the cases. The physical or clinical symptoms displayed by those still living were often typical of hog cholera and therefore added something to the picture. Hematological examination, especially when an enumeration of the leukocytes suggested a leukopenia, was a point to be regarded as a valuable diagnostic aid. Not infrequently, where two and sometimes three pigs from the same herd could be examined, we found that they presented similar pathological lesions. Finally, and most convincing and even more valuable than the postmortem findings were those cases (19) in which some of the blood or other tissue extracts were filtered and portions injected into susceptible pigs, these animals later developing hog cholera.

THE FINDINGS

Skin: The skin is frequently described as the locale of a characteristic tissue change in hog cholera. The lesion consists principally of a passive hyperemia. It is recognized grossly by the bluish to purplish discoloration of the skin, which is more properly described as cyanosis. The cyanotic areas usually occur on the ventral surfaces of the thorax and abdomen and medial surfaces of the forearm, thigh and leg, ear, perineum and snout. The extent or size of the hyperemic area or areas varies. It may be a small spot of 1 centimeter or less in diameter or a large blotch of 15 or more centimeters; sometimes it involves the entire ventral surface of the body. Edema and, later, necrosis and sloughing of the epidermis occur in some cases. The latter almost never occur in the acute cases of hog cholera, but only in those that linger for many days.

The recognition of cyanotic changes in the skin is limited to a great extent by the pigment of the skin. Because of this it is difficult to obtain information on the frequency of occurrence of lesions in the skin, a point that is clearly shown in this study.

In series A, where complete records were kept of the breed, sex, weight, etc., of the pigs, cyanosis of the skin was observed in 71.4 per cent of the Chester Whites, in 25 per cent of the Duroc Jerseys, but not in a single Poland China that was examined. The records are not sufficiently complete as to the breed and sex of the animals comprising series N, and therefore no comparable statistics can be compiled from our material. When the data on the entire group are analyzed, however, it is found that cyanotic lesions of the skin are recorded in 22.4 per cent of the cases. Lesions characteristic of necrosis and sloughing were found in one animal.

Larynx: Disturbances in the flow of blood characterized by small hemorrhages and diffuse hyperemia are sometimes observed in the larynx. The hemorrhagic changes are the more common and occur as small, circumscribed red spots (petechiae) or as larger and more diffuse hemorrhagic areas (ecchymoses and suggillations). Although the hemorrhages may occur in the mucous membrane of any part of the larynx, their most frequent location was the mucous membranes covering the oral surface of the epiglottis. In the cases that manifested the hyperemic lesions, it was generally noted that congestion was quite diffuse and involved relatively large areas of the laryngeal mucosa.

The data on the two groups show that hemorrhagic or hyperemic lesions occurred in 66.6 per cent of the cases in series A and 58.3 per cent in series N.

Lungs: The lungs of cholera-stricken swine may not show any gross pathologic changes or they may be the seat of extensive changes. Changes, when they do occur, are marked by either circulatory and vascular dysfunction and disturbance or by inflammation. The latter is usually looked upon as an expression of secondary and complicating factors.

Capillary hemorrhages, appearing as petechiae and ecchymoses beneath the visceral pleura and in the lung parenchyma, are lesions that can be readily and easily

observed. Hemorrhages of this kind were found in 41.6 per cent of the swine in series A and in 24.8 per cent in series N.

Chronic passive congestion is not infrequently observed. The apical and cardiac lobes are the parts of the lung generally involved and the anterior borders of the diaphragmatic and intermediate lobes are next in frequency. The extent or amount of lung tissue involved in some cases amounts to only a few lobules and these may be scattered in a lobe. In others an entire lobe or lobes are affected. In series A, 60.4 per cent showed lesions which were recorded as chronic passive congestion and in series N, 42.2 per cent.

The vulnerability of the lungs to inflammatory reaction is well known. Inflammation of the lungs or pneumonia often follows when the body resistance is lowered from any cause. Cardiac decompensation and cardiac failure, with their concomitant circulatory changes, are predisposing factors. Surely, the resistance of cholera-sick swine is decreased over normalcy, and it seems quite probable that the virus exerts a decompensatory effect on the heart. Exposure to dampness and draughts no doubt contributes to the development of pneumonia in cholera-sick swine. In fact, the immediate cause of death in many cases appears to be an inflammation of the lungs. In most cases the inflammatory lesion represents a typical bronchopneumonia and sometimes a pneumonia lobar in type is observed. Pleuritic effusion and fibrinous exudation between the visceral and parietal layers of the pleura often are associated with this type of pulmonary inflammation.

Pulmonary lesions of inflammatory nature were observed in 14.5 per cent of the swine in series A and in 44.7 per cent of those in series N.

Heart and Pericardium: The lesions observed in the heart and pericardium of cholera-affected swine consist primarily of petechiae and ecchymoses. In a great many of our cases, hemorrhages of this type were found in the epicardium of the auricles and ventricles, in close proximity to the coronary groove. Another region in the heart where hemorrhages occur quite often is that just beneath the ventricular endocardium, adjacent to the area from which the musculi papillares arise. When hemorrhages occur in the pericardium, they are found most often on the inner surface.

Hemorrhagic lesions of the heart and pericardium occurred in 10.4 per cent of the cases in series A and in 32.1 per cent of the cases in series N.

Spleen: A splenic lesion that is quite frequently observed in this disease is infarction. Infarcts are another pathological manifestation of disturbance in the flow of blood through the tissues. Infarcts may be dark red in color (hemorrhagic infarct) or sometimes they may appear as pale, yellowish-white areas (anemic infarct). Hemorrhagic infarcts in the spleen of cholera-stricken swine appear as well defined hemorrhagic areas, dark red or black and raised slightly above the surface of the spleen. The size of the infarcted area may be very small or it may reach a diameter of 30 mm. or more. On section, the area is more or less saucer-shaped, the thickness being equal to about one-third the diameter. The number of infarcts occurring in a single spleen is variable. We have counted as many as 31 and have seen many in which but one infarct occurred. The borders and apex of the spleen are the parts where infarcts have been found most often, although they may be situated in any part of the spleen. Anemic infarcts are much less common. In series A 68.7 per cent of the pigs showed hemorrhagic infarcts in the spleen and in series N, 58.7 per cent.

Chronic passive congestion of the spleen is found in some cases. The spleen in these cases is enlarged and generally quite firm. The capsule is tense and, when cut, the parenchyma bulges into the cut area. Small, subcapsular hemorrhages, which are often bright red and which are located on the visceral surface and borders of the spleen, are not uncommon. These have been described as lesions having diagnostic significance for hog cholera, but our experience does not support this view. Hemor-

rhages of this kind have been found in many healthy and, as far as we could determine, normal swine, and they are found to occur in swine which have died of other diseases.

Sixty-eight per cent of the pigs in series A showed hemorrhagic changes of the spleen, and 58.7 per cent of the pigs in series N. Of the 33 (68.7 per cent) cases with hemorrhagic splenic lesions in series A, 28 or 84.8 per cent were infarcts and five or 15.1 per cent, chronic passive congestion. The records were not sufficiently complete on series N to separate the changes into infarction and chronic passive congestion.

Lymph Nodes: The lymph nodes (lymph glands) are included by most writers with the organs and tissues that reveal gross pathologic changes of diagnostic importance in hog cholera. The lesions occurring in the lymph nodes are usually of three general types: (1) That characterized by hemorrhagic infiltration where the hemorrhage is especially marked at the periphery of the node. This type is very common. The blood collects in the spaces between the capsule and trabeculae and the lymphoid tissue of the parenchyma. The area or tissues in the center of the hemorrhagic zones are light in color. Nodes so affected are often referred to as "mottled" or "strawberry-like." (2) That marked by swelling and hyperemia. The nodes are quite large and firm and the color varies, depending upon the amount of blood, from reddish-pink to dark red and reddish-black. The blood collects about the margins and follows the trabeculae toward the central part of the node. (3) In this type the entire node is markedly infiltrated with blood and the color is generally very dark red to black. While these three types of nodal lesions are found to occur in hog cholera, it is not unusual to find that one type occurs in all of the nodes in the body in some cases, whereas in others two or three types are observed in a single cadaver. It is necessary that the node be incised before a particular type can be definitely recognized.

The nodes routinely inspected at the autopsy are the submaxillary, anterior and middle cervicals, mediastinals, bronchial, gastric, hepatic, mesenteric, colic, lumbar, iliac and superficial inguinals.

Lesions similar to those described were found in some of the nodes in 91.6 per cent of the cases in series A and 82.1 per cent in series N.

Kidneys: Petechiae and ecchymoses on the surfaces and in the parenchyma of the kidneys are generally described as characteristic macroscopic lesions of the disease. They have been found to occur in a very large percentage of the swine included in this study. In those cases of hog cholera that were infected in our laboratories, 46 of the 48, or 95.8 per cent, showed hemorrhagic lesions in the kidneys, and in the pigs that had contracted and developed the disease under natural conditions, 263 of the 286, or 91.9 per cent, revealed this lesion.

Petechiae occur as small pin-point or punctate hemorrhages, and ecchymoses as larger hemorrhagic spots. The latter may reach 2 mm. in diameter. Hemorrhages larger than this are more properly termed suggillations. The number of petechiae or ecchymoses to be found in a single kidney are quite variable. In some cases only three or four were found, while in others the number reached into the hundreds. In this respect it is interesting to note that the number, size and character of the hemorrhages in one kidney are usually equal to the number, size and characteristics of those in the opposite kidney. Exceptions have been observed but in only a comparatively few cases. Since changes of this kind frequently occur in the cortical and medullary zones of the kidney, as well as in the mucous membrane lining the hilus, it is advisable to section the kidney from pole to pole.

It is not uncommon to find that the kidneys exhibit hyperemic changes, but generally the lesions are not marked.

Urinary Bladder: The changes in the urinary bladder are particularly those of hemorrhage and congestion. The hemor-

TABLE I—Frequency of occurrence of gross lesions in organs and tissues of cholera-affected swine.

Organ and Tissue	Artificially Infected Series (Series A—48 Cases)		Naturally Infected Series (Series N—286 Cases)		The Combined Series (Ser. A+N—334 Cases)	
	No. Showing Lesions	Per Cent Showing Lesions	No. Showing Lesions	Per Cent Showing Lesions	No. Showing Lesions	Per Cent Showing Lesions
Kidney	46	95.8	263	91.9	309	92.5
Urinary Bladder	46	95.8	232	77.6	278	83.2
Lymph nodes	44	91.6	235	82.1	279	83.5
Spleen	33	68.7	168	58.7	201	60.2
Larynx	32	66.6	167	58.3	199	59.6
Lungs						
Hyperemia	29	60.4	121	42.2	150	44.9
Hemorrhage	20	41.6	71	24.8	91	27.2
Inflammation	7	14.5	128	44.7	135	40.4
Large intestine						
Hemorrhage in mucosa	11	22.9	71	24.8	82	24.6
Hemorrhage in serosa	3	6.2	18	6.2	21	6.3
Inflammation	2	4.1	44	15.3	46	13.8
Heart	5	10.4	92	32.1	97	29.0
Liver	3	6.2	*	*		
Small intestine						
Hemorrhage in mucosa	2	4.1	29	10.1	31	9.3
Hemorrhage in serosa	4	8.3	20	6.9	24	7.2
Inflammation			1	.3	1	.3
Stomach						
Hemorrhage in mucosa	2	4.1	27	9.4	29	8.7
Hemorrhage in serosa	1	2.0	12	4.5	13	3.9
Inflammation	1	2.0	11	3.8	12	3.6
Skin†						
Cyanosis and hyperemia	10	20.8	64	22.4	84	25.1

*Insufficient data for comparative analysis.
†Cyanosis and hyperemia in the skin are difficult to recognize in swine with pigmented skins and therefore the value of this statistic is not comparable with others in this table.

rhagic lesions are petechiae and ecchymoses. They occurred most frequently in the mucous membrane and generally in that part which lines the vertex and body of the bladder. The number of petechiae and ecchymoses found varies greatly. Bladders have been examined where the mucosa was literally "peppered" with small punctate hemorrhages and in other cases one would have to search carefully to find three or four. Hemorrhages are sometimes seen beneath the serous covering of the bladder. Many times these hemorrhages are more linear than round, and usually the blood is much brighter in color. The congestive changes generally involve large areas of the mucous membrane and extend into the muscular coats. Sometimes the walls are greatly thickened, and the affected surfaces appear very dark.

Lesions indicative of circulatory disturbance in the urinary bladder occurred in 95.8 per cent of the pigs in series A and 77.6 per cent in series N. In four cases of the latter series, hemorrhages occurred beneath the serosa as well as in the mucosa, and in eleven cases the infiltration of blood was great, producing a marked congestion.

Stomach: The stomach is not a common site for the occurrence of gross lesions in hog cholera. The changes that are observed represent disturbances in the flow of blood more often than inflammatory reactions. It is usually necessary and always advisable to wash the inner surfaces free from ingesta before making an inspection of this organ. As a rule, the petechiae and ecchymoses are not as prominent in the gastric mucosa as they are in the mucous membrane of the urinary bladder. They

are usually a little more faded. The fundus and pyloric regions are the more common sites for the hemorrhagic lesions. Small hemorrhages are occasionally observed beneath the serosa, especially the area comprising the greater curvature of the stomach. Punctate hemorrhages, suggillations and even larger hemorrhagic blotches may be found in this region and often they occur in linear streaks, such as have been referred to as "paint brush" hemorrhages. Congestive changes ranging from slight hyperemia to marked congestion and involving primarily the mucosa have been found in many of the cases examined. Ulcers have been observed and, when found, usually occur in the fundus. A single or several small ulcers have been seen.

Hemorrhagic changes in the gastric mucosa are recorded for 4.1 per cent of the cases in series A and 9.4 per cent in series N. Hemorrhages beneath the serosa were noted in 2 per cent of series A and 4.5 per cent of series N. Ulcerative changes occurred in 2 per cent of series A and 3.8 per cent of series N.

Small Intestine: The lesions observed in the small intestine are similar to those described for the stomach. Hemorrhagic lesions of the mucosa occurred in 4.1 per cent of series A and 10.1 per cent of series N. In series A hemorrhagic lesions occurred in the subserosa in 8.3 per cent of the cases and in series N, 6.9 per cent of the cases.

Large Intestine: The changes occurring in the cecum and colon do not differ from those occurring in the stomach and small intestine. Hemorrhagic changes involving the mucosa and serosa, characterized by petechiae, ecchymoses, suggillations, hyperemia and congestion, may be found.

Inflammation and especially the inflammatory reaction typified by ulceration is more commonly found in the large intestine than in the stomach and small intestine. The ulcers were characterized by a dry, crusty, circular mass of necrosed tissue and dehydrated exudate, and they appeared to rest upon the surface of the mucous membrane. Close inspection of one of these ulcers shows that its structure consists of a series of concentric or annular rings or layers of necrosed tissue, the edges of which are very irregular and rough. They vary in color; some are red, others brown, green or black with small specks of yellow-colored, amorphous material more or less scattered throughout the ulcer. They also vary in size. Ulcers which measure 2 mm. in diameter were seen in some cases. The largest single ulcer that was observed measured 34 mm. In some cases the sizes varied, whereas in others all the ulcers were about equal in size.

The number in a single case varies. A single or solitary ulcer occurred in some animals, while as many as 47 were counted in others. The usual site or location for the ulcerative lesions was in the upper or proximal end of the cecum and first part of the colon. Their occurrence in the lower colon and rectum was very uncommon. Ulcers of the kind described have been referred to on many occasions as "button ulcers" and for many years were considered a very significant and important diagnostic lesion of hog cholera. Its position in this respect has been less favorably accepted in recent years.

Hemorrhagic lesions involving the mucosa occurred in 22.9 per cent of the pigs in series A and in 24.8 per cent of those in series N. The serosa revealed hemorrhagic lesions in 6.2 per cent in series A and 6.2 per cent in series N. Inflammatory changes, characterized by the formation of "button ulcers," were observed in 4.1 per cent of the pigs in series A and 15.3 per cent of those in series N.

Other Organs and Tissues: With the exception of the liver, the autopsy records are incomplete on the organs and tissues not discussed above. This applies more particularly to series N. The pathologic change of the liver most often recorded is chronic passive congestion, and this occurred in only 6.2 per cent of the animals in series A.

The conjunctivae, tonsils, pharynx, brain, spinal cord, hypophysis, thyroid, adrenals, pancreas, gonads and bones of many of the

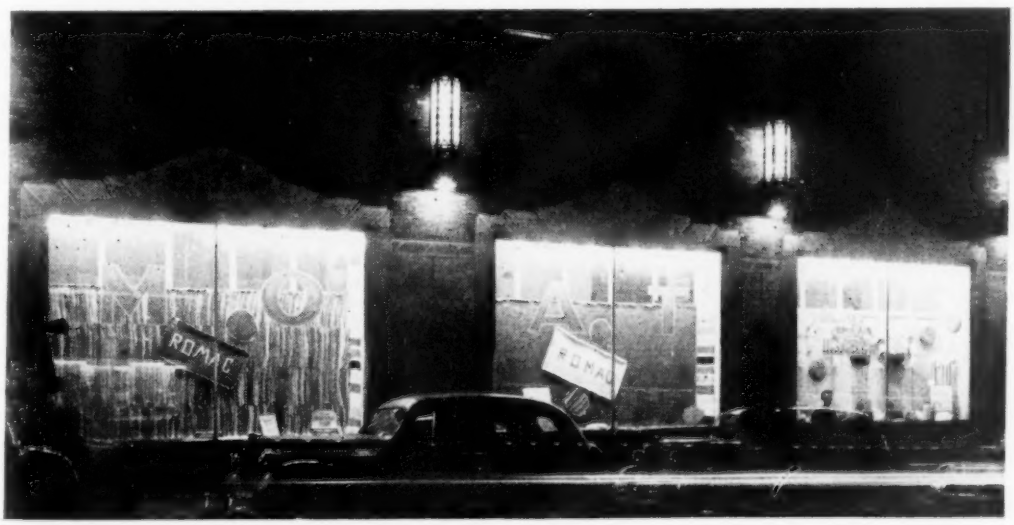
swine in these series were examined. The mucous membrane of the eyes was congested and the eyelids covered with a sticky and semi-dried exudate in a large number of cases. The conjunctivae of some revealed small, punctate hemorrhages. The tonsils were swollen and the crypts filled with a caseous exudate in a few of the animals. Ulcerative changes were observed in the walls of the pharynx in two of the animals received from the field. Petechiae were found in the brain of some of the pigs and similar hemorrhagic lesions occurred in the gonads of three. No significant gross changes were seen in the hypophyses, thyroids, adrenals or pancreases examined, and we were not able to find definite gross abnormalities in the cancellous parts of the bones.

COMMENT

This study and the reports of the postmortem findings in hog cholera by others make it evident that the principal gross pathologic lesions found in this disease are produced by disturbances in the flow of blood. Hemorrhagic changes, such as small, circumscribed, punctate red spots (petechiae) and slightly larger and more diffuse bloody areas (ecchymoses) predominate. They result from rupture of the capillary vessels. The hyperemic changes appear to be a manifestation of a cardiovascular syndrome, in which the circulation is slowed in the area or region where the change occurs. The inflammatory reactions are more particularly secondary changes which are superimposed on a tissue that has already been rendered less resistant by the action of the virus of hog cholera.

The cases of hog cholera included in series A represent a group upon which little doubt need be raised as to the certainty of the disease which caused the pigs to sicken and regress to a moribund state. Since the etiological factor was known, it is reasonable to assume that the morbid changes found in these animals were the result of the virus used to infect them. The fact that they were free from an infectious disease at the time the virus was injected and did not contact any infectious swine disease during the course of the hog-cholera-virus syndrome adds much to the significance of the lesions which they displayed at the time of the post mortem. It is reasonable to consider that the cases in this series represent about as "pure" cases of hog cholera as we could expect to produce.

This Firm Will Entertain the Ladies at the Memphis Meeting



Among the many features of entertainment planned for the ladies in attendance at the Memphis meeting is a trip through the McCallum & Robinson Cotton Pickery. Here they will see how the famous Romac mops and rugs are manufactured, and each will receive a practical, useful souvenir.

The value of series N is attributed to the following reasons: (1) The number (268) included in the series is sufficiently large to be of statistical significance; (2) they came from farms where greater or lesser numbers of swine were sick and dying; (3) the number of different farms represented was approximately 190 and hence it may be assumed that 190 outbreaks of the disease are included; (4) the farms were located in many different portions of the state; (5) the period of time (20 years) covered tends to reduce somewhat any periodic effects which might exist unrecognized; (6) the condition of the tissues was highly satisfactory for postmortem inspection (approximately 66 per cent of the animals were destroyed five to 15 minutes previous to the autopsy), and (7) the presence of associated or complicating infectious disease can be minimized.

Table I summarizes the statistical data. It is set up to show the results obtained on each series and also when the data are combined. The order and arrangement of the several categories are based upon the percentile rank calculated for each in the artificially infected series, since it represents cases of hog cholera of known origin.

The results of these two series reveal some interesting facts. They show quite clearly that lesions resulting from disturbances in the flow of blood occurred most frequently in all of the organs and tissues examined. The occurrence of hemorrhagic changes in the kidneys was outstanding in both series. The urinary bladder, lymph nodes, spleen, and larynx showed changes involving the blood vascular tissues in more than 77 per cent of the cases, which suggests the importance of inspecting these parts when conducting postmortem examinations on porcine carcasses.

Considerable difference is noted between the two series in respect to the inflammatory changes occurring in the lungs. A much higher percentage of the naturally infected swine showed pneumonic lesions. This might be expected, since it is quite probable that many of the pigs in this series were subjected to environmental conditions contributing to the development of pneumonia. The fact that a lower percentage of these pigs did not exhibit hemorrhagic lesions may be attributed to the inflammatory changes which tend to overshadow or mask such lesions. Inflammatory changes were observed in the large intestine in a greater percentage of the cases in the naturally infected series than in the artificially infected ones. Again, this may be expected because many of the animals brought to us for inspection had been sick for eight to ten days or more, and ulcerative lesions are more likely to occur in the lingering and more chronic cases of the disease.

Although the lesions which have been described occurred in swine affected with hog cholera, it is not to be construed that any or all occur only in this disease. Congestion and hemorrhage are changes which occur in other virus diseases and in diseases where bacterial toxins, chemical poisons and snake venoms are involved.

It is our opinion that studies of this kind have not received the attention they merit. From such studies the true value of certain lesions can be learned and their significance as a diagnostic aid determined.

Hog-Cholera Virus in the Guinea Pig

The virus of hog cholera inoculated into the testicles of the guinea pig gives to that animal a disease transmissible in series, the virus exalting for guinea pigs with each successive passage. After the fifth day in the body of the guinea pig, the virus loses its pathogenic properties for hogs and protects hogs against virus that has sojourned for a more or less short time in the guinea pig, but not against original porcine virus. By passage through the body of an animal not habitually susceptible to the disease, the pathogenic as well as the antigenic properties of the virus are therefore transformed. *(G. Le Chuiton, C. Mistral, and I. Dubreuil, Compte Rendus de l'Académie des Sciences, Abstracted in Recueil de Médecine Vétérinaire, cxv (March, 1939), p. 175.)*

Spontaneous Ulcer of the Stomach in Several Domestic Animals

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THERE IS no general agreement in regard to the etiology of ulcer of the stomach in man or in animals. This report summarizes a series of researches on the bacteriology of ulcer of the stomach in domestic animals performed during the past few years.

The seasonal occurrence of ulcer is rather striking, corresponding more or less to the seasonal distribution of other diseases. During the latter part of the winter and spring months, we observe a greater incidence of spontaneous ulcer in cattle, hogs, and sheep. During the summer and fall, when the animals are in pasture, the condition is rarely observed. At any time, however, one may observe large, healed scars in the mucous membrane, which may or may not indicate abrasion from coarse foods. Practical men in the abattoir are of the opinion that these active ulcerations in cattle and sheep in the late winter and spring are the result of eating the dry, coarse foods furnished during these months.

In 1915, Rosenow[1] first studied the bacteriology and pathology of stomach ulcer in domestic animals and reported that he consistently isolated green-producing streptococci from these lesions in the hog, calf, cow, sheep, and dog.

PROCEDURE

Our method of study was as follows: The hemorrhagic and infiltrated areas were washed in running water and excised with sterile instruments. The area was then seared. Portions were dissected out, macerated in mortar with pestle in sterile air, and emulsified in sterile saline solution. Glucose-brain-broth tubes and blood-agar pour plates were inoculated with the emulsions. The inoculated mediums were incubated for 24-48 hours at 35° C.

The incidence of ulcer in the calf and cow is said to be about 1 in 70; the sheep, 1 in 60; the dog, 1 in 50; and the hog, 1 in 30.* Textbooks usually state that peptic ulcer is observed more frequently in calves than in other animals coming up for slaughter. This conclusion is borne out by our observations. In our series of observations, not allowing for seasonal distribution, we find that our data, based on 8 years of inspection, show:

10,000 observations, calves and cows	=1 in 80
4,000 observations, sheep	=1 in 70
20,000 observations, hogs	=1 in 20

These animals were marketed from upper Missouri and the Mississippi Valley area.

Oxidizing or green streptococci were isolated from every ulcer and hemorrhagic area occurring in twelve cows and twelve calves studied. From the sheep material, streptococci were obtained in each culture from 20 different animals. Every active lesion cultured in the hog's stomach yielded streptococci. In ten dogs with experimental ulcer and spontaneous ulcer, streptococci were isolated from the stomach lesions in seven. Twenty attempts at culturing in glucose brain broth, sections of normal mucosa, and peritoneal and muscular coats of calves' acid stomach resulted in one positive culture of streptococci but bacilli of the colon group were usually present.

Histopathological sections of the hemorrhagic and ulcerous areas in the non-acid stomach of the cattle and sheep studied revealed, by Gram-Weigert staining, marked diffuse leukocytic infiltration sometimes extending through the submucosa into the muscular coat. The mucous membrane cells were necrotic out beyond the actual ulcerated area. Diplococci and streptococci were to be seen usually along the margin of the ulcer. Colon bacilli or small Gram-negative bacilli were found on the upper surface of

*Mortality rates from this condition are unknown to us. Death may be brought about by perforative peritonitis in consequence of the necrotic process through the coats of the stomach.

the ulcers but never in the infiltrated tissues.

In the acid-secreting stomachs of the cattle and sheep examined, the lesions were found to resemble the lesions in swine, dogs, and peptic ulcer in man. That is to say, the ulcers were small, and usually free from necrotic tissue. The infiltrations were sharply demarcated and limited to the submucosa. Gram-Weigert stained sections failed to reveal the presence of streptococci in 50 per cent of these lesions but cultures in glucose brain broth usually revealed streptococci.

BACTERIOLOGY

The streptococci isolated during the course of this study presented no peculiarities of morphology or cultural characteristics. They were all of the alpha or viridans type, *i. e.*, peroxide producers. None of the cultures hemolyzed blood and their oxidizing capacity was that of streptococci usually found in infected teeth, tonsils, and other foci in man and animals. With none of the cultures were we able to induce dissociation or mutation.[2] When injected intravenously into rabbits (7 cc. of 24-hour glucose brain-broth culture), the streptococci produced hemorrhage in the following proportions:

Ten strains of streptococci isolated from sheep injected into ten rabbits produced lesions of the stomach (hemorrhage or ulcer) in six of the animals. Ten strains of streptococci isolated from calves injected into ten rabbits produced lesions of the stomach and duodenum (hemorrhage and ulcer) in nine of the animals.

Primary cultures of the streptococci from the original lesions and from the lesions in the rabbits were then studied in regard to their serological characters and to their electrical charges as measured by cataphoresis.

There was cross agglutination with the sera prepared by injecting horses with peptic ulcer strains over a period of six months. These strains appeared to be anti-

TABLE I—Yield of Pepsin from Linings.
(USP Pepsin = 1:3,000)

	No Ulcer or Scars	Healed and Active Ulcers	No Ulcer or Scars	Healed and Active Ulcers
Number of Stomachs	101	100	100	100
Weight before mincing	29 lbs., 11 oz.	29 lbs., 9 oz.	28 lbs., 13 oz.	29 lbs., 11 oz.
Weight per lining	0.293 lbs.	0.2956 lbs.	0.288 lbs.	0.2969 lbs.
Weight after mincing	29 lbs., 6 oz.	29 lbs., 9 oz.	28 lbs., 9 oz.	28 lbs., 11 oz.
Amount digested	28 lbs., 6 oz.		27 lbs., 9 oz.	
Weight of digest	43.5 lbs.	40 lbs.	41.5 lbs.	40 lbs.
Solids by weight	9.62%	9.67%	9.10%	9.84%
Dry weight of digest	4.18 lbs.	3.87 lbs.	3.78 lbs.	3.84 lbs.
Activity of dry weight	1:3,700	1:3,400	1:3,700	1:3,000

PEPTIC ACTIVITY OF HOG STOMACH LININGS

Our knowledge of the effect of these ulcerated and hemorrhagic areas (also healed scar-tissue areas) on the peptic activity of hog stomach "linings" is in a state far from clarified. Many biological supply firms are of the opinion that excessive hemorrhage and ulceration of the hog's stomach makes for a pepsin of low titre. On the other hand, actual processing for pepsin has shown that pepsin of high titre may be had from these "linings." Table I shows the results of two tests for peptic activity on hog stomachs free from ulceration or scarring and "linings" with dark, healed ulcers and active ulcers. We may safely conclude that peptic activity is but little influenced (in the commercial sense) by spontaneous ulceration of hog stomachs.

genically homologous, notwithstanding their diverse habitats. The peptic ulcer strains of streptococci of human origin were identical in characteristics with these strains of animal origin.*

Ten dogs were selected and some of the molar teeth were devitalized in each. The ulcer-producing streptococci were injected into the root canals and out to the apices of the teeth. The conditions were similar to those following the devitalization of teeth in human dentistry. The infected teeth became discolored, but were firmly fixed in the alveolar sockets. There was rarefaction and absorption of bone in the periapical region without swelling or tenderness. Seven of these dogs developed ulcer of the stomach and four of the animals developed cholecystitis. Ten control dogs, when autopsied, showed ulcer and cholecystitis in one animal only.

Electrical measurements, *i. e.*, the magnitude of the negative electrical charge of each bacterium, were made after the methods of Jensen *et al.*[3]

It was found that the ulcer-producing streptococci or the streptococci isolated from ulcerous areas in animals possessed approximately the same electrical charges.

The position of ulcer streptococci when grouped in sequence of the magnitudes of negative charges and compared with other types of streptococci is as follows:

	Cataphoretic mobility μ sec. 140 volts
Kidney strains	7.0 (circa)
Neuritis strains	16.6 (circa)
Arthritic strains	25.0 (circa)
Endocarditis strains	28.0 (circa)
Ulcer strains	32.0 (circa)
Cholecystitis strains	38.4 (circa)
Septicemic strains	50.0 and above

The question now arises: Are the streptococci found in ulcers primary or secondary invaders? Must we postulate a traumatic basis for these ulcers we see in calves, sheep, hogs, and dogs? To our minds, the similarity of the strains of ulcer streptococci in cultural characters, morphology, serological characteristics, in electrical charges and, finally, the ability of these strains to reproduce ulcers or hemorrhage in rabbits and dogs, gives us a basis for believing that these streptococci are primary rather than secondary or agonal invaders. Since there are no apparent foci of infection to be found in these domestic animals, it is possible that the microbe enters the body through the gastrointestinal tract.

*Data on streptococci in ulcer of the stomach of man to be published.

SUMMARY

Streptococci of the oxidizing variety, *i. e.*, viridans, were isolated from ulcer of the stomach in the hog, sheep, calf, cow, and dog.

Hog stomachs, when processed for commercial pepsin, show no appreciable differences in pepsin titre when the "linings" are ulcerated with many healed areas or when the "linings" show no signs of present or past infection.

The streptococci isolated from ulcer of the stomach in dogs, sheep, calves, hogs, and man were usually identical in antigenic properties, cataphoretic mobility, oxidizing capacity, and pathogenicity. The incidence of ulceration, both healed and active, in stomachs of animals slaughtered is: Calves and cows, 1 in 80; sheep, 1 in 70; and hogs, 1 in 20.

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Sulfanilamide Inhibits Regeneration

Tests made on dogs by Bricker and Graham (*J. A. M. A.*, June 24, 1939) to determine the effect of sulfanilamide on the healing of wounds made experimentally in the stomach showed that the drug given in doses comparable to the therapeutic dose for man has an inhibiting effect on the healing process.

Complete cures of dourine are obtainable from intravenous injections of novarsenobenzol. A subtoxic dose of 15 gm. for a stallion of 420 kg. is recommended. Tests for detecting the parasite are the proofs that a cure has been effected.—*Colin.*

Maintenance of Echinococcus in the United States*

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THAT HYDATID infection of animals is widely distributed in the United States and that in some areas it occurs with considerable frequency is well known to workers in parasitology. Morris[1] in 1927 stated that hydatid cysts occurred in about 5 per cent of the hogs at the municipal abattoir at Baton Rouge, La., and that in previous years the incidence had been as high as 20 per cent. He observed that there had been a marked decrease in the incidence of the infection, which he attributed to the exceedingly dry years of 1924 and 1925, and also to education of the farmers as to the nature and source of this infection.

Exact data regarding the occurrence and distribution of the parasite are lacking but available figures tend to show, as emphasized by Magath,[2] that its prevalence in domestic animals is on the decline. There is, however, evidence of a high incidence of the parasite in Louisiana, Virginia, Arkansas, Tennessee and Missouri.

Meager as are definite data relative to the occurrence of hydatids in domestic animals, such information is almost nonexistent as regards the incidence in wild mammals. In recent years, Dr. Fenstermacher, of the division of veterinary medicine of the University of Minnesota has been conducting an extensive study of the diseases of our native moose. (*Alces americanus*).[3, 4] In this study the division of entomology and economic zoology of the University has coöperated by collecting and identifying the animal parasites found. Early in the work it became evident that there was a remarkable incidence of hydatid infection of the lungs of these moose.

Four of the cysts from the lung of a moose calf were fed to a dog by F. G. Wallace,[5] at that time an assistant in the division, and 44 days later a large number of typical specimens of *Echinococcus granulosus*. Subsequently, the experiment was successfully repeated by Gordon Fredine, with cysts from the lung of another animal.

To date, the cysts have been found on autopsy in the lungs of eleven out of 21 of the moose from northeastern Minnesota. This figure can not definitely be said to be a normal one, since the moose examined were in all instances diseased. However, it is clear that the symptoms observed in most of the animals were not due to the presence of the parasites.

Hadwen[6] reported finding hydatids in 1929 in a moose from Le Pas, Manitoba, and Law and Kennedy[7] briefly record a heavy lung infestation in a moose. While no locality is given, the animal was presumably from Ontario, where the writers are located. Von Linstow in the supplement to his "Compendium der Helminthologie" records the cysts in the musculature of the European elk, (*Alces alces*), which is regarded by some mammalogists as the same as our so-called "moose."

In the course of the examination of 58 deer (*Odocoileus virginianus*) from Minnesota, the cysts were found in one animal, which was one of twelve from the same region where most of the infected moose had been obtained. Magath[2] cites Weidman[8] as listing echinococcus cysts in one fallow deer (*Dama dama*) and two white-tailed deer (*O. virginianus*), from the Philadelphia zoo. "The source of the animals was not stated. The cysts in the latter were in the lungs and the animals almost certainly came from the United States." There are a number of European records of echinococcus cysts in deer.

Despite the incidence of hydatids in domesticated animals and even of cases in man that were clearly contracted in the United States, there is only one authenticated record (Curtice[9]) of the occurrence

*Assistance in the preparation of these materials was furnished by the personnel of Works Progress Administration Official Project No. 165-71-6999-3-400.

of the adult parasite in dogs in this country. This is the stranger, because thousands of these animals have been examined specifically for intestinal parasites.

Of other animals usually listed as possible hosts of the adult worm, the domestic cat has been reported as very difficult to infect. More important is the fact that in various attempts to produce an experimental infection, the worms have developed slowly and did not reach maturity even in such experiments as those of Southwell,[10] where kittens harbored only immature specimens 68 days after feeding. In the fox they had matured in 27 days. Barbagallo[11] reported that of some 200 cats examined at Cagliari, Italy, one harbored *E. granulosus*, but he gives no indication as to whether they were mature. Lörinez[12] fed cysts to eleven dogs and 51 cats. In the dogs the parasites were sexually mature in 36 days but in the cats the worms developed much more slowly and "apparently were not able to reach maturity." From this, and the fact that the majority of the cats suffered marked diarrhea, Lörinez concludes that they are unsuitable hosts of Echinococcus.

Records of the natural infection of foxes are not altogether wanting, but they are few and far between. Brailsford,[13] who had examined without results 100 dogs in England, says that the only three specimens of intestine bearing the mature worms which he had seen were taken from foxes. A patient who on x-ray examination showed hydatid cysts in the lungs and liver confessed that she had trained a pet fox to take chocolates from her lips. Southwell[10] fed a hydatid cyst to a recently caught English fox and 27 days later found very large numbers of the mature, but not gravid, worms in the intestine. Neumüller[14] records the presence of numerous specimens of *E. granulosus* in a wild fox in central Germany, shot because of its sickly appearance. Cameron[15] states that the adult worms are found in wild foxes and in dogs and that as they are generally larger in the fox, it may be assumed that this animal is the more natural host. That they have opportunities for becoming infected is evident from the fact that rabbits, squirrels, and other small mammals are known to be susceptible to hydatid infection. Records of the cysts in birds are very few and require careful checking.

Most textbooks on parasitology list the wolf among the primary hosts of Echinococcus. As far as I have been able to discover, all of these reports, until very recently, go back to Cobbold, 1864, who in his "Entozoa" makes the bald statement that "This little tapeworm, in its strobila condition, infests only the dog and the wolf." In none of his earlier publications does he mention the wolf. Cameron[16] describes what he considers a new species, *E. minimus*, from *Canis lupus* from Macedonia.

The finding of the hitherto unsuspected high incidence of the hydatids in our native moose afforded an opportunity to obtain evidence as to what are the primary hosts in this section and probably in other parts of the United States where the infestation occurs. Through the coöperation of a game warden, Dr. Fenstermacher of the University obtained three specimens of our native timber wolf, *C. lupus lycaon*, the animal which seemed most likely to be the culprit. On laboratory examination two of the three were found to harbor great numbers of the typical adult worms. A report of these findings and their implications was made by Riley.[17]

Renewed efforts were made to locate additional natural infections in wolves, coyotes, and other possible hosts. In the course of this work there have been examined, from Minnesota, twelve timber wolves (*C. lupus lycaon*), 26 coyotes (*C. latrans*), 25 gray foxes (*Urocyon cinerioargenteus*) and 25 red foxes (*Vulpes fulva*).

Unfortunately, to the present time it has not been possible to obtain more than an occasional coyote or red fox from the extreme northeastern section of the state (Saint Louis and Cook counties), where the hydatid-infested moose were found. All of the gray foxes were from the southeastern part of the state. For these reasons the wholly negative results tend to indicate that the infection is at present confined largely to the one section. Why this

is true is not readily apparent, for moose are not uncommon as far west as Lake of the Woods and Beltrami counties. Through the coöperation of Mr. Jack Manweiler of the Soil Erosion Service we have been able to examine 17 coyotes from the former and three from Beltrami. The results, as in the case of the remaining six coyotes, were negative.

Very different is the situation regarding timber wolves. To date, we have had available twelve carcasses and, of these, five harbored the adult tapeworm. Two out of three from Cook county, October, 1933, were positive (Riley[17]). One taken in Saint Louis county in June of 1937 was negative; but recently, through the courtesy of Mr. W. J. Breckenridge of the University Museum of Natural History, we have been able to examine four additional wolves from this county and three of them harbored the adult worms. Thus five of eight timber wolves from the region where the infected moose were found were the primary hosts of this dangerous parasite.

Up to the present time we have not been able to secure data concerning the probable occurrence of hydatids in cattle and sheep in the area. Some years ago there was an intensive effort to encourage the rearing of sheep in the region, and it is evident that conditions would have been favorable for the development of the hydatids in them. The possibility of human infections is not to be disregarded.

In the light of available information, it is highly probable that in the United States the maintenance of hydatid infection in domesticated as well as in wild mammals is due to the fact that wolves play the rôle of primary hosts. In Minnesota the wolf implicated is *C. lupus lycaon*. In the southern states particular attention should be given to *C. rufus gregori*, since its distribution, as given by Goldman,[18] is "lower Mississippi River basin, mainly the western side, in southeastern Missouri, Arkansas, southeastern Oklahoma, eastern Texas and Louisiana." This range includes most of the areas in which there recently has been a noticeable incidence of echinococcosis in domesticated animals.

The fact that there are not more records of dogs carrying the adult Echinococcus in the United States must not be considered as absolving them from responsibility in the spread of the infection to other animals or to man. As in the case of our knowledge of the incidence of the larval infections, we need much more extensive and critical studies.

In this connection, it should be emphasized that students of parasitology and of food habits of wildlife should bear in mind that there is a very definite hazard in examining the intestinal contents of carnivores. The adult worms are not more than one-sixth of an inch in length and might readily be overlooked, in spite of their numbers. Strict precautions should be observed to prevent the accidental ingestion, directly or indirectly, of the eggs.

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A Case of Sheep Tuberculosis Due to the Bovine Type

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THE INTERNAL organs from a sheep, with the appearance of a generalized tuberculosis, were submitted to us by federal inspectors* with a request for an opinion as to whether or not the condition in question was tuberculosis. We thought that it was tuberculosis but because this disease is uncommon in sheep and since our museum did not contain any specimens from tuberculous sheep, we decided to employ typing tests to verify our opinion.

The only history available was that the organs were obtained from an old ewe that had been sent to slaughter. The specimens submitted for examination were the spleen, kidneys, and a small portion of the diaphragm. The lesions were old, as judged by the large and extensive areas of calcification.

The lungs (fig. 1) contained widespread tuberculous lesions with large areas of calcification as well as many pinhead-sized lesions. These small lesions were very firm and fibrous. The pulmonary lymph glands were similarly involved. Large, calcified lesions were observed on the liver (fig. 2). Nodules were found on the entire surface of the spleen. There were widespread lesions in the kidneys, mostly pinhead in size and very firm. The small portion of the diaphragm was covered with nodules and had the appearance of pearly disease. The lesions were whitish gray rather than the yellowish gray frequently seen in bovine lesions. No acid-fast bacilli could be found.

INITIAL TESTS

Sections taken from the various tissues showed all of the characteristics of tuberculosis when examined microscopically. An emulsion was prepared from the lymph glands and spleen and injected into two rabbits, two guinea pigs, and one chicken. One and one-half months after the injections, the chicken reacted when tested with avian tuberculin. One and one-half months after injection, one guinea pig was lame with a large, swollen lymph gland the size of a hazelnut and was destroyed. Creamy pus and semisolid material which contained acid-fast bacilli were found in the lymph gland and surrounding tissues. The spleen was studded with small nodules and there were areas of necrosis on the surface and in the substance of the liver. Acid-fast bacilli also were found in the spleen. Microscopic sections of the spleen and liver were very suggestive of tuberculosis.

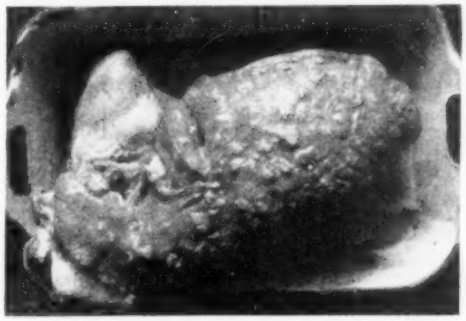

Fig. 1. Lung of the sheep. Note the widespread tuberculous lesions with large areas of calcification.

Two months after injection, the remaining guinea pig, the two rabbits, and the chicken were tested intradermally. Mammalian tuberculin was used at one site and avian tuberculin at another. The guinea pig, one rabbit, and the chicken reacted to mammalian tuberculin but not to avian tuberculin. The other rabbit died during the tuberculin test. Postmortem examination revealed the lungs to be filled with nodules varying from pinpoint to pinhead in size. Virtually no normal lung tissue remained. The spleen was about five times

*These specimens were submitted by Dr. C. J. Millen, inspector-in-charge, U. S. bureau of animal industry, Philadelphia, Pa., and Drs. Schick and Novy.

its normal size and contained numerous small nodules, the largest of which were ½ cm. in diameter. The liver was studded with white nodules. The parietal pleura and mesentery were covered with numerous nodules. Acid-fast organisms were found in all places.

Two and one-half months after injection, the second rabbit died. Extensive lesions were found in the lungs, liver, spleen and parietal pleura. At this time the other guinea pig and the chicken were tested with mammalian and avian tuberculin. The guinea pig died shortly after the injection of tuberculin and showed extensive lesions of tuberculosis in the regional lymph gland, lungs, liver, and spleen. From the spleen of this animal a pure culture of tubercle bacilli was isolated.

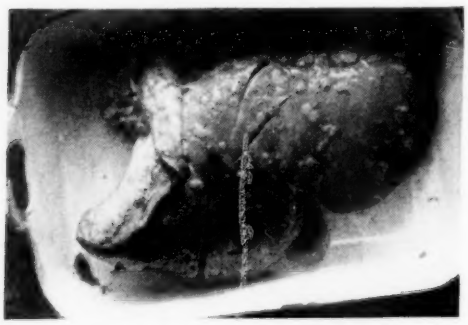

Fig. 2. Calcified lesions on liver of the sheep.

The chicken did not react to either tuberculin and was destroyed. It was in good condition. The spleen was studded with small tubercles, ranging in size from a pinpoint to a pinhead, but no other lesions were found. A few acid-fast bacilli were found in the tubercles.

FURTHER TESTS

An emulsion was prepared from the spleen of this chicken and injected into two guinea pigs, two rabbits, and two chickens. The two guinea pigs were injected intramuscularly, one rabbit intraperitoneally and the other intravenously, and the chickens intravenously.

Five weeks after injection, each was tested intradermally with mammalian and avian tuberculin. All reacted to the mammalian but none to the avian tuberculin. One week following this test, one guinea pig died. The regional lymph gland was about three times its normal size and acid-fast organisms were observed in the gland. The rabbit injected intravenously died two months after injection and lesions were detected on the lungs, liver, spleen and kidneys.

About two and one-half months after injection, the other guinea pig and rabbit and the two chickens were tested with mammalian and avian tuberculin. The guinea pig, the rabbit, and one chicken reacted to the mammalian tuberculin but not to the avian. The second chicken was negative to both. The guinea pig died shortly after the tuberculin test and showed tuberculosis of the regional lymph gland, lungs, and spleen. The chicken that reacted was killed. No lesions of tuberculosis and no acid-fast bacilli were found, however.

Four months after injection, the rabbit and the chicken that remained were tested again. The rabbit reacted to the mammalian tuberculin but not to the avian, and the chicken was negative. Both were destroyed. Several lesions were found on the liver, kidneys, and peritoneum of the rabbit, while in the chicken no lesions could be detected.

A culture isolated from the guinea pig that had been injected with sheep material was tested for pathogenicity by the following method. One rabbit was injected intravenously with 1 mg. of pure culture; two rabbits were each injected intravenously with 0.01 mg. of pure culture; and one chicken was injected intravenously with 0.1 mg. of pure culture. Generalized tuberculosis was produced in all three rabbits within two months but no tuberculosis was observed in the chicken.

The same test was conducted with a pure culture isolated from a guinea pig that had succumbed to tuberculosis after injection with material from the spleen of the chicken. When injected with material from the sheep, lesions of tuberculosis were found in this chicken. The rabbits in this test died of extensive tuberculosis within two months, while the chickens remained

well. Two months after injection, the chickens reacted to mammalian tuberculin but not to avian tuberculin. They were destroyed and did not show any lesions.

Conclusions Reached Through Tests

These tests showed that this strain of tuberculosis was the bovine type. A strain of tubercle bacilli is bovine when 0.01 mg. of pure culture injected intravenously into rabbits causes massive infection followed by death within two months. A strain is avian when 1 mg. of pure culture injected intravenously into rabbits causes death within two to four weeks, without gross lesions but with large numbers of bacilli in the spleen. A strain is avian when 1 mg. of pure culture injected intravenously into chickens causes death with tuberculosis; but a strain is bovine when tuberculosis is not produced.

The evidence obtained shows that this is a case of sheep tuberculosis of the bovine type. Tuberculosis in the sheep is rare. Van Es[1] states, "Sheep tuberculosis is as rare as can be." Calmette[2] says, "Tuberculosis is relatively rare in sheep." Harshfield and Roderick[3] comment, "Tuberculosis of sheep is so exceedingly rare that a case is primarily a pathological curiosity." The report of the chief of the Bureau of Animal Industry of the United States Department of Agriculture for 1937 shows a total of 17,663,158 sheep inspected, of which 22 were condemned for tuberculosis. Sixteen cases of tuberculosis in sheep were examined in the laboratory, of which 15 showed acid-fast organisms. Animal inoculations indicated that all were of the avian type.

A Review of the Literature on Tuberculosis of Sheep

Because tuberculosis in sheep is rare, few cases have been typed. M'Fadyean[4] was the first investigator to report a case which, from guinea pig injection, was thought to be mammalian in type. M'Fadyean[5] later reported another case in sheep, mammalian in type. Fullerton[6] reported one case, also mammalian in type. Griffith[7] reported two cases, both avian, of generalized tuberculosis in sheep. Van Es[1] reported on a small lesion of tuberculosis from a sheep that typed human. Jowett[8] described two cases that were bovine. Van Es and Martin[9] reported one case that typed bovine. Harshfield and Roderick[3] mentioned seven cases, all of which typed avian. Harshfield, Roderick and Hawn[10] reported on 19 additional cases. Eighteen of these typed avian and one was indefinite.

Immunity of the Chicken to Mammalian Tuberculosis

The case presented above shows that a bovine strain may survive for a time when passed from a sheep to a chicken. Chickens are usually considered refractory to mammalian tuberculosis. Calmette[2] states, "Hens are rarely susceptible to mammalian types but, under certain circumstances, may be infected with human or bovine bacilli." Feldman[11] states, "Chickens are extremely resistant to the bacteria of human and bovine tuberculosis. Lesions produced after intravenous injection are never progressive and tend to disappear after a relatively short time." Feldman reported on two chickens that had reacted in an initial test with avian tuberculin after infection with bovine cultures, but were negative on subsequent tests.

The chicken that was affected in this case reacted once to avian tuberculin but, on a later test with both avian and mammalian tuberculin, reacted only to the mammalian. This chicken was destroyed and slight lesions were found in the spleen. This strain could not be transferred further to chickens but was transferred to guinea pigs and rabbits with the same results that it produced originally from the sheep. The strain may have lost its pathogenicity for chickens by one transfer but it seems probable that a chicken especially susceptible was encountered in the first injection.

Comment

Most of the cases of tuberculosis in the sheep thus far typed have been avian. This strain is certainly not avian, as judged on the basis of its behavior in chickens or

guinea pigs. The pathogenicity of this strain for guinea pigs and rabbits, with the widespread lesions produced in both, seems to indicate that it is bovine.

The occurrence of tuberculosis in the sheep is relatively rare, and the bovine type is encountered even less frequently. The writers therefore consider the case reported herein rather significant. In addition, the fact that this strain proved pathogenic for a chicken is worthy of note.

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Bovine Tuberculosis

The eradication of bovine tuberculosis and Bang's disease will eventually have a salubrious effect upon the incidence of other diseases which menace the dairy cattle industry, for with these infections under control, mastitis, metritis and interrupted reproduction from one cause or other decline concurrently, according to authenticated observations.

In a series of experiments to determine the curative properties of sulfanilamide in experimentally induced anthrax in guinea pigs, Mitchell, Walker and McKercher (*Can. Jour. of Comp. Med.*, May, 1939) found guinea pigs quite susceptible to the action of that drug. When given in sufficient doses to maintain a fair amount of the free drug in the blood, the guinea pigs died from its toxic action.

Cosmetic, Caudal Amputation

If the Almighty wanted the bony part of a horse's tail six inches shorter, why didn't He make them grow that way?—*The Governor of Michigan, as reported in The American Mercury.*

Immunization Against Foot-and-Mouth Disease

When properly used, the foot-and-mouth disease vaccine Riems is harmless and does not cause vaccination breaks. Outbreaks of foot-and-mouth disease did occur, following the vaccination prior to the establishment of immunity, as late as the eighth day when bovine virus vaccine was used and as late as the 15th day when either culture virus vaccines and their mixtures or diluted bovine virus vaccines were used. These outbreaks, however, were not vaccination breaks but, rather, were due to infection either before or following the vaccination.

When vaccination is carried out with bovine virus vaccine, the formation of the immunity develops rapidly and smoothly. As early as three to five days after the vaccination, the immunity has developed to the point that the majority of the vaccinated cattle are immune to contact infection. After eight to ten days, all vaccinated cattle are protected against contact infection.

When culture virus vaccine is used, the immunity develops much more slowly. In herds vaccinated with bovine virus vaccine, 95 per cent of the cattle proved to be immune against contact infection after eight to nine months of observation. Cattle vaccinated with culture virus vaccine proved to be sufficiently protected against general exposure for a term of three to four months, but not against contact infection. *(Die aktive Immunisierung gegen Maul- und Klauenseuche mit Miemser MKS.-Vakzine nach Waldmann und Köbe (Active Immunization Against Foot-and-Mouth Disease According to the Method of Waldmann and Köbe, Riems), by Haan and Maas. Berliner and Munchener Tierarztl. Wochenschr. (No. 11, 1939), p. 165.)*

Studies on the Course of Trichostrongyle Infestation in Sheep

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IN AN EFFORT to obtain more data on the variation in susceptibility to trichostrongyles, stated by Stewart, Miller, and Douglas[1] to exist not only among various breeds of sheep but also among the individuals within a breed, an opportunity was provided for a study of the course of the infestation when parasite-free lambs of different ages were given a known number of infective larvae and maintained free from natural reinfestation. This paper is a report on these studies and includes the age susceptibility of the host, the daily fluctuation in egg count, and the duration of patency of the parasite, based upon egg counts.

METHODS

Raising Lambs—At the age of 24 hours, lambs were taken from ewes and placed in quarters having concrete floors that had been thoroughly cleaned and disinfected. As far as could be determined, all of these lambs, with the exception of one, a purebred Hampshire ewe, were crossbred. The majority of them were obtained from the division of animal husbandry and came from ewes that had been on nutritional experiments. Others came from stock ewes of the division of veterinary science. The purebred lamb was obtained from a local breeder.

Until one week of age, the lambs were bottle-fed raw bovine milk four times daily. From 1 to about 5 weeks of age, depending on the state of nutrition, they were fed three times daily and, from then until weaning, they were fed twice daily. They were weaned at approximately 8 weeks. The animals were allowed access to ground barley, leafy alfalfa hay obtained from ground not used for pasturing live stock, rock salt, and clean water from the time they entered the quarters. Since the flock was assembled during the winter, it was deemed necessary for the first month to provide a light covering of wood shavings for bedding in a section of the quarters. The floor was swept daily, washed, and disinfected weekly. Attendants and others entering the quarters wore overshoes provided for this purpose only.

Infestation—Eighteen lambs ranging from 1 to 4 weeks of age were infested by administering orally in hard gelatin capsules a known number of infective larvae. With the exception of the first two lambs, which each received 500, the dosage was 1,000 larvae. The larvae were obtained by a culture of feces from naturally infested sheep. These proved to be a mixture of *Ostertagia circumcincta* and *Trichostrongylus colubriformis*. Oesophagostomum spp. were present in amounts usually less than 2 per cent.

In order to study the infestation in older animals, eight lambs, maintained free from nematode infestation, were artificially infested with 1,000 larvae each at 1 year of age. Five of the lambs received *T. colubriformis*, while the remaining three received *O. circumcincta*. A pure culture of the latter was secured by depositing adult males and females, obtained from an aged ewe autopsied for the purpose, directly into the abomasum of a nematode-free lamb. Fecal culture produced infective larvae, which were then administered orally to the same lamb. In this manner, a supply of infective larvae of known species was constantly available. A pure culture of *T. colubriformis* was obtained from one of the lambs artificially infested at 1 week of age.

Following infestation, the lambs were placed in quarters apart from the noninfested animals. As a control to determine possible natural reinfestation, two noninfested animals were maintained in the same quarters as the infested lambs.

Egg Counts—Fecal samples were ob-

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tained, with few exceptions, daily from infested lambs and controls. Although the intrinsic incubation period of the parasite had been established by other workers, it was deemed advisable, in the first cases, to begin the fecal examinations one day after infestation. This procedure served as an indicator of a possible previous natural infestation. Egg counts were made first by a flotation method and, when justified by numbers, by a modification of the Caldwell method, as described by Stewart, Miller, and Douglas.[1]

RESULTS

Infestation at 1-4 Weeks of Age—Two of the lambs died early from pneumonia. All of the others survived and no clinical manifestations of parasitism were observed. The number of days that elapsed between infestation and the appearance of eggs in the feces ranged from 18 to 26, with a mean of 20.35 days. On the basis of fecal egg counts, the lambs could be divided into three groups: susceptible, resistant, and intermediate. From 16 charts prepared, three have been selected which show typical pictures for each of the groups. Figure 1 contains typical charts showing the course of the infestation in the susceptible, intermediate, and resistant groups. A year after infestation, the termination of patency had not been reached. Noninfested controls remained negative throughout the experiment. Fecal cultures showed, with the exception of lamb 72, which had a pure infestation of *T. colubriformis*, a mixed infestation of *O. circumcincta* and *T. colubriformis*. Oesophagostomum spp. were present in four animals. Since the number of Oesophagostomum exceeded 2 per cent

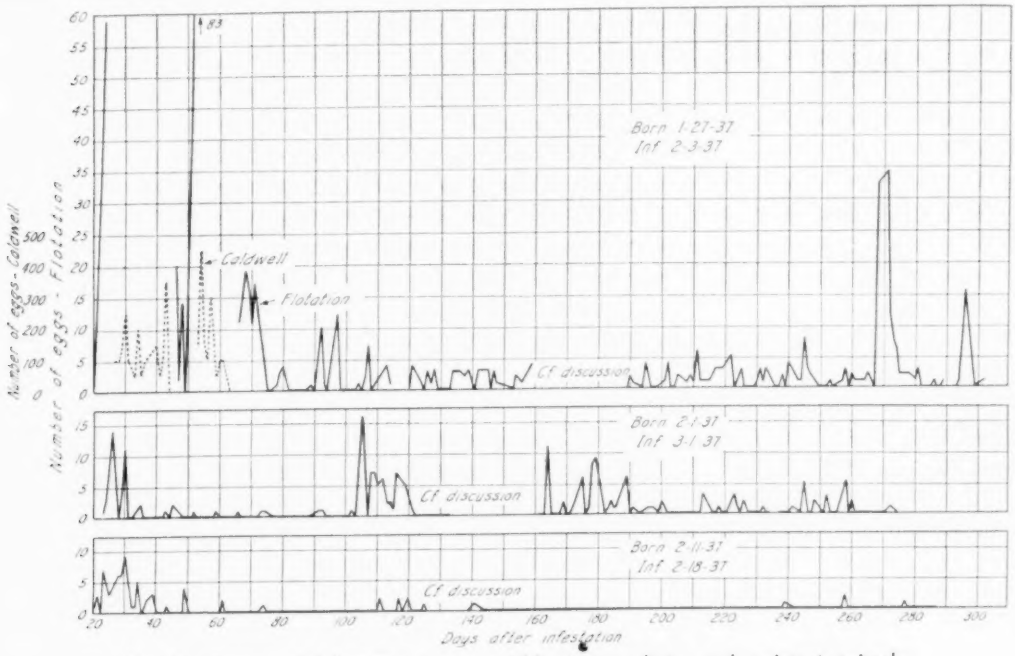

Fig. 1. Course of infestation in susceptible, intermediate, and resistant animals.

The flotation method used was as follows:

Approximately 1 gm. of feces was placed in a 15-cc. centrifuge tube. To this was added 4 cc. of a 30 per cent antiformin solution, for the purpose of digesting the feces. After digestion had been completed, the tube was filled with a sodium bichromate solution with a specific gravity of 1.35 and centrifuged. Following this, two standardized loopfuls were removed from the surface of the liquid and examined under the microscope for eggs. Fecal cultures were made periodically to determine the species present.

of the total number of parasites in only one animal, as shown by culturing feces, this contamination, although undesirable, was not deemed important in the present work.

Infestation at 1 Year of Age—Figure 2 is typical of the sheep infested at 1 year of age and shows a highly susceptible host and one of low susceptibility. The figures show only slight differences in the course of infestation from that found in animals infested at an earlier age.

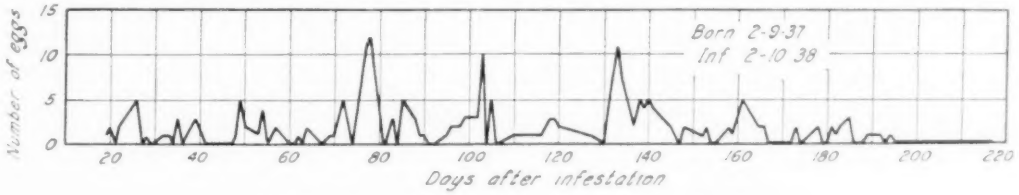

Fig. 2. Course following infestation at 1 year of age.

DISCUSSION

In the foregoing experiments a low degree of infestation prevailed and it was necessary, with the exception of susceptible animals early in the course of infestation, to adopt a flotation technic rather than the Caldwell method in estimating the number of eggs. It is realized that under these circumstances some error may obtain. Since a uniform procedure was adopted, however, those fluctuations observed in the daily egg counts of all the animals, especially in the susceptible group, are significant.

The results agree in general with those of Veglia,[2] especially those obtained in his work on *T. colubriformis* (syn. *T. instabilis*) and *Strongyloides papillosus*, but the more or less cyclic fluctuations in oviposition are not very clearly defined in his results, both as regards succession of peaks and negative phases, and he made no reference to variation in susceptibility of different individual hosts to the parasites with which he worked. The differences between the results of the two investigations may be due to the fact that Veglia infested his animals with larger numbers of parasites, that the infective larvae were not administered in single doses but in a series of doses over a considerable period of time, and that he determined the reproductive rate by larval cultures and not by egg counts. Veglia's graphs show a gradual rise to the ultimate peak of egg production, whereas in the present paper only those pertaining to the older animals show such a picture. In the younger animals the graphs show the initial peak to be attained rapidly. However, marked fluctuation in daily egg output is apparent in both investigations.

Figure 2 does not show any difference from figure 1, which the authors feel can be definitely stated to be significant. In the older animals, however, the ultimate peaks were attained less rapidly than in the younger animals.

Britton[3] also reported a marked variation in the strongyle egg count of horse feces. In this case counts were made by the Stoll dilution technic. These fluctuations and negative phases indicate the necessity, in estimating the efficiency of an anthelmintic, of making frequent fecal examinations over a prolonged period of time.

During July and the early part of August, 1937, egg counts were consistently negative in animals infested in February of that year. This was not apparent in those infested the following year. Since this occurred during a period of reorganization within the divisions of the University and at a time when a change in technical assistants was made, it was felt that counts over the period could not be relied upon. Consequently, as indicated in the charts, they were discarded. It will be noted in figure 1 that in the susceptible animal the egg count rose considerably on the 268th day. This was evident in many of the lambs at this season, especially in the susceptible group. It may possibly be accounted for by the fact that seasonal

rains had started, and the alfalfa hay had become damp. The stools appeared somewhat mushy in many of the lambs. The condition was transient and subsided in about two weeks.

Veglia[2] states that a short period of low oviposition precedes a period of corresponding high rate of oviposition. From the data obtained during the present investigation, this appears to be true only in particularly susceptible animals and not in animals of an intermediate grade of susceptibility or low susceptibility.

The duration of oviposition was longer than had been anticipated. In all three groups it was still apparent a year after infestation. In the resistant group long, negative phases, such as may be seen in figure 1, followed by positive findings were encountered. The fact that noninfested controls remained consistently negative eliminated the possibility of these being due to reinfestation.

CONCLUSIONS

1. Lambs at 1 week of age are susceptible to trichostrongyle infestation.

2. Resistance and susceptibility based on the fecal egg count are present not only at this age but at more advanced ages as well.

3. There is no apparent difference in the degree of susceptibility between animals 1 month of age and those 1 year of age.

4. There is a fluctuation in the egg count from day to day in untreated animals. In anthelmintic investigations where efficiency is based upon egg counts, it is necessary to make such counts daily over a prolonged period of time.

5. The duration of oviposition is at least one year.

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Historic Paradox

The invention of the pneumatic tire in 1891 by Veterinary Surgeon J. B. Dunlap was called one of the paradoxes of history in an address before the Belfast Rotary Club, says *Veterinary Record*. The paradox lies in the fact that the discovery practically put the horse out of the transport business, the business from which the inventor made his living.

Sheep Diseases—Diagnosis and Prophylaxis

Ekthyma contagiosum (scabby mouth, warty lip) of sheep is caused by a dermatotrope, filtrable virus, transmissible by direct contact. The incubation period lasts six to eight days. After this time, the region of the lips becomes inflamed and a number of nodules are produced. This papulo-vesicular stage is followed by the vesiculo-pustulous stage, and terminated by the crustous stage.

From the diagnostic point of view the disease is to be differentiated from sheep pox, which is caused by a different virus, from sore mouth (mycotic stomatitis), which is characterized by a sweetish odor from the mouth and cheesy membranes upon the mucosa, and from foot rot (necrobacillosis), in which lesions of the lips are absent. Light forms of the disease do not call for any special treatment. Advanced stages are to be treated with tincture of iodine. When infection threatens entire herds, protective vaccination should be resorted to at the first sign of an outbreak of the disease. Ekthyma contagiosum is transmissible to man. (*Praktische Winke für die Diagnose und Bekämpfung der wichtigsten Schafkrankheiten (Diagnosis and Prophylaxis of the More Important Sheep Diseases), by Th. Oppermann. Tierärztl. Rundschau, xlv (1939), p. 2.)*

Unquestionably, the milk fever riddle is about to be solved by the combined researches of the endocrinologist and chemist. The rôle of calcium, phosphorus, magnesium and manganese in nervous physiology is gradually clarifying the mystery.

Primary Neoplasms in the Genito-Urinary System of Dogs: A Report of Ten Cases

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VARIOUS types of neoplasms have been observed in the genito-urinary system of dogs. From personal observations and reports of cases cited in the literature, it appears that tumors of the testes and transmissible lymphosarcoma (venereal granuloma) occur most frequently. I have noted primary neoplasms in the genito-urinary system of 61 dogs. In 50 cases the neoplastic disease was primary in the testes. However, only one of the remaining 11 cases was affected with transmissible lymphosarcoma. The tumors of the testes from 48 dogs were reported in detail by McDonald, Bollman, and the writer.[1, 2] The incidence and pathology of transmissible lymphosarcoma have been treated comprehensively by Feldman.[3] Therefore, further mention of these tumors will be omitted in this paper. At this time I wish to report the primary occurrence of other neoplasms in the ovaries, uterus, kidneys, bladder, urethra, cervix, and vagina of ten dogs.

A review of the available literature indicates that primary neoplasms have been observed in nearly all of the organs comprising the genito-urinary system of dogs, but they are of infrequent occurrence. Crocker,[4] in 1,548 necropsy examinations of dogs, observed primary neoplastic disease in the genito-urinary system in ten of these animals. In two cases the tumors occurred in the testes.

Feldman studied a series of 78 tumors obtained from dogs. Only four of these neoplasms occurred in the genito-urinary system; two were primary in the testes and two were primary in the ovaries. Jackson[5] reported the occurrence of a leiomyoma and a leiomyolipoma of the vagina, a carcinoma of the prostate, and a carcinoma of the testis. These occurred once in each of four dogs. Bollman and the writer[6] studied the prostate glands from 250 dogs of various ages; 150 of these dogs were more than 5 years of age and many were aged, but we failed to find a single true neoplasm in this organ.

The primary occurrence of neoplasms in the kidneys of dogs has been observed by several investigators. Crocker[4] observed adenocarcinoma of the kidneys in two dogs.

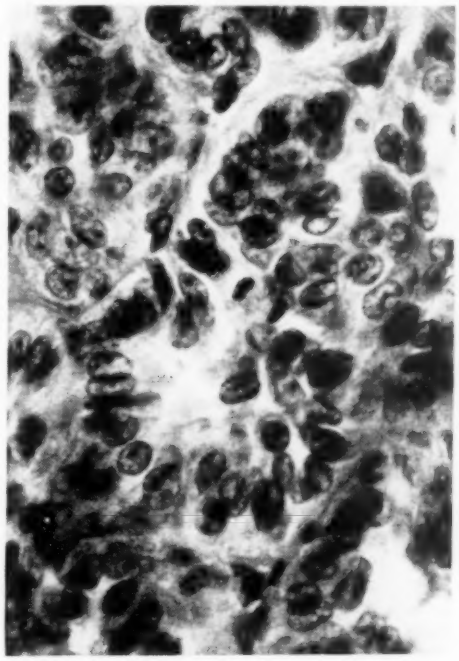

Fig. 1. Adenocarcinoma of the ovary, case 1 (x 660).

M'Fadyean[7] observed unilateral hypernephroma in the left kidneys of two dogs. Dunn[8] reported the occurrence of an angiosarcoma in the right kidney of an 8-year-old dog. Wright[9] surgically removed a carcinomatous left kidney from a 7-year-old dog. The neoplastic kidney weighed 270 gm.

Various types of primary neoplasms have been observed in the uterus of dogs. Crocker observed a fibroma and Williams and Hobday[10] reported the occurrence of a myoma in the uterus of an 11-year-old dog. They surgically removed the uterus and ovaries. Barto[11] observed an adenosarcoma in the uterus of a 3-year-old dog.

The vagina is a common site for the occurrence of transmissible lymphosarcoma, but other types of neoplasms are infrequent in this organ. An osteochondrofibrosarcoma of the vagina was noted by Crocker. A leiomyoma and a leiomyolipoma of the vagina were reported by Jackson.[5] A leiomyoma was also observed by Ball and Dauville.[12]

Fig. 2. Cross section of tumor in the wall of the uterus, case 3.

Crocker observed osteoma of the penis in one dog and carcinoma of the prepuce in three. A sarcoma of the prepuce and glans penis of a 7-year-old dog was reported by Ball and Rossi.[13]

Stalker and the writer[14] reported the occurrence of a primary carcinoma in the urethra of an aged Boston Terrier. I failed to find a similar case reported in the literature. This case is included in the ten cases of primary neoplasms of the genito-urinary system of dogs reported herein.

TUMORS OF THE OVARIES

Case 1—A Boston Terrier, female, 16 years of age, was brought to me because of persistent vomiting and progressive emaciation of two-week duration. It had enjoyed apparently good health prior to this illness.

Clinical examination and roentgenograms of the abdomen failed to reveal the cause of these symptoms. The dog died the following day.

Necropsy examination revealed a linen thread about 10 inches long extending through the intestines from the pylorus to the posterior portion of the rectum. The end within the stomach was attached to a large wad of artificial sausage covering, and the other end was firmly anchored in the rectum. The thread broke from its site of anchorage in the rectum before its means of attachment was determined. The entire intestine was bunched or pulled together. The wad of artificial sausage covering was too large to enter the duodenum and was too firmly attached to the thread extending through the intestine to permit its being regurgitated. The thread had cut through the wall of the intestine from constant pressure and death was due to generalized peritonitis.

The thoracic and abdominal organs were examined for the presence of neoplasms or other gross lesions. Attached to the left ovary was a small nodular mass which appeared to be a part of the ovary. There were no other gross lesions.

Microscopic study of the left ovary revealed the small attached tumor mass to be a primary papillary adenocarcinoma of the ovary (fig. 1.).

Case 2—A French Bulldog, 12 years of age, was brought to me to be destroyed because of loss of sight resulting from bilateral cataracts.

Antemortem examination revealed some

small nodules, 1 to 3 cm. in diameter, in the two posterior mammary glands and a small flat tumor, 2.5 cm. in diameter, in the skin on the posterior surface of the right foreleg immediately above the carpus. The latter was a recurrent tumor; the original tumor had been excised three years before.

Necropsy examination failed to reveal definite macroscopic neoplasms in the thoracic and abdominal organs. However, microscopic examination revealed the presence of a primary adenocarcinoma in the right ovary. The histological structure of this neoplasm was similar to that observed in case 1.

Microscopic study of the mammary tumors revealed them to be primary adenocarcinomas. The skin neoplasm from the right foreleg was a plasma-cell myeloma.

TUMORS OF THE UTERUS

Case 3—A mongrel Collie, female, 8 years of age, was brought to me to be destroyed because it had an extensive ulcerating primary squamous-cell carcinoma of the mammary gland.

Necropsy examination failed to reveal extension of the carcinoma of the mammary gland to other organs of the body. Examination of the uterus, however, revealed a raised tumor, 3 cm. in diameter, attached to and invading the mucosa of the left horn. This appeared cystic on cross section (fig. 2).

Microscopic study of the neoplasm in the uterus revealed it to be a primary adenocarcinoma of the uterus. It appeared to have its origin in the uterine mucosa. In some regions the neoplastic process appeared to infiltrate the wall (fig. 3).

Case 4—A Cocker Spaniel, female, 2 years of age, had had one litter of pups. The owner did not wish to raise more pups from it and so brought it to me to be spayed.

The operation was performed under ether anesthesia through a midline incision. When the abdomen was opened and the uterus was exposed, a nodule approximately 2 cm. in diameter was noted in the left horn of the uterus about 1 cm. from the bifurcation (fig. 4). Because of the presence of this tumor, the entire uterus was removed with the ovaries. Recovery was uneventful.

Microscopic study of the tumor in the uterus revealed it to be a chorioepithelioma.

TUMORS OF THE KIDNEYS

Case 5—The dog was an aged mongrel Collie, male. Its physical condition was good and it was in apparently good health. Euthanasia was performed because of its advanced age.

Necropsy examination revealed a small gray tumor, 1 cm. in diameter, situated in the cortex of the left kidney. The other organs of the abdomen and thorax were grossly normal.

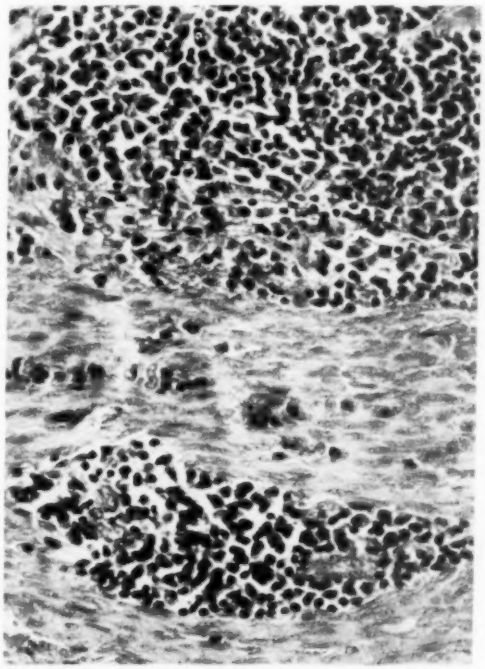

Fig. 3. Photomicrograph of uterine tumor, case 3, adenocarcinoma (x 250).

Microscopic examination of the tumor in the left kidney revealed it to be a typical hypernephroma (Wilms tumor).

TUMORS OF THE URINARY BLADDER

Case 6—The dog was a mongrel Terrier, male, approximately 5 years of age. Its illness was of short duration. Some weakness of the hind legs was noted in the evening and it died during the following night.

Necropsy examination revealed gross lesions in the urinary bladder only. This organ was slightly enlarged and thickened.

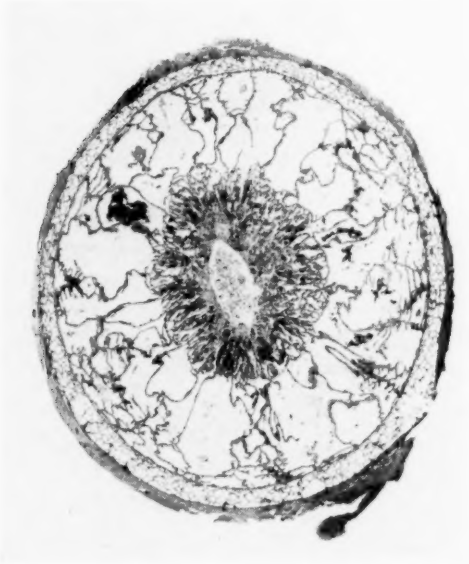

Fig. 4. Cross section of tumor in the uterus, chorioepithelioma, case 4 (x 3½).

The mucosa was raised into irregular ridges and nodules and appeared hypertrophic. Grossly, the lesion appeared to be inflammatory (fig. 5).

Microscopic examination of the lesion in the urinary bladder revealed it to be a primary squamous-cell carcinoma.

Fig. 5. Gross picture showing squamous-cell carcinoma in the urinary bladder of dog, case 6.

Microscopic examination of the brain and spinal cord revealed multiple foci of degeneration. Since this dog manifested symptoms of myelitis, the lesions in the central nervous system probably were the cause of death. Symptoms referable to disease in the genito-urinary system had not been noted.

Case 7—The dog was an aged mongrel Collie, male. The physical condition was good. It was destroyed because of its advanced age.

Necropsy examination revealed a hypertrophic prostate and an infiltrating neoplasm in the fundus of the urinary bladder. There was no gross evidence of neoplastic disease in the other organs.

Microscopic examination of the prostate revealed the enlargement to be due to benign hypertrophy of the glandular tissue in this organ. Microscopic study of the tumor in the urinary bladder showed it to be a primary squamous-cell carcinoma.

CARCINOMA OF THE URETHRA

Case 8—This case was reported in detail by Stalker and the writer.[14] The dog was a Boston Terrier, female, 13 years of age. Symptoms of progressive urinary difficulties had been observed for three months. The animal made frequent attempts to urinate and the amount of urine voided at each micturition gradually decreased. At the time of examination a constant, slow dribbling of urine from the urethra was noted. No bleeding from the urethra had been observed.

Clinical examination revealed a large cystic tumor in the lower part of the abdomen. This was freely movable and, when pressure was exerted on it, there was an increase in the rate of dribbling of urine. Examination of the urethra and bladder by palpation through the rectum disclosed a firm tumor, approximately 2 by 2 cm. in diameter, situated in the urethra at the neck of the bladder. The bladder was firmly distended.

Surgical exploration through a midline incision revealed the obstructing tumor mass to be situated in the urethra at the

neck of the bladder. The urethra was so completely obstructed that the bladder could not be emptied by direct application of pressure. The condition appeared to be inoperable and the dog was immediately destroyed by inhalation of ether.

Fig. 6. Gross picture showing ulcerating, squamous-cell carcinoma within the urethra. The urethra has been cut open from end to end, case 8.

At necropsy examination the bladder and urethra were removed and opened. This revealed the neoplasm to be situated within the urethra. It appeared ragged and ulcerating (fig. 6). There was no gross evidence of extension of this neoplasm to other organs.

Microscopic examination of the neoplasm from the urethra showed it to be a primary squamous-cell carcinoma of the urethra.

MYOMA OF THE CERVIX

Case 9—A toy Shepherd, female, 6 years of age, was brought to me for surgical removal of a pedunculated tumor of the cervix. The tumor was 3 cm. in length by 1.5 cm. in diameter and protruded through the vulva. This had existed for more than six months.

The dog was anesthetized with ether and the tumor was excised with a thermocautery. Recovery was uneventful.

Microscopic examination of the tumor from the cervix revealed it to be a myoma.

FIBROSARCOMA OF THE VAGINA

Case 10—An Airedale, female, 14 years of age, was brought to me to be destroyed because of progressive failure in health for over two months.

Necropsy examination revealed primary neoplasms in the right lobe of the thyroid gland and in the right wall of the vagina. The tumor in the vagina was 3.5 by 4.5 cm. in diameter and on cross section was found to be cystic (fig. 7).

Fig. 7. Gross picture of tumor in wall of the vagina, case 10.

Microscopic examination of the thyroid gland revealed the presence of an adenocarcinoma in the enlarged right lobe. The tumor in the vagina was found to be a fibrosarcoma. Both neoplasms were primary in the organs in which they were found.

COMMENT

It is interesting to note that all but two of the neoplasms reported in this paper

occurred in dogs that were 6 years or more of age. Six of the ten animals could be classed as old.

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Rickets

Rickets is a defect in calcification of bones during the period of growth. The trouble lies in the endochondral plates—connecting medium in early life between the shaft of the bone (diaphysis) and the two ends (ephiphyses). Within these plates there is a continuous formation of cartilage cells arranged in orderly columns. Governed by vitamin D, these cartilage cells degenerate to make channels for the blood vessels and to be replaced by osteoblasts. The degenerative process begins at the shaft side of the plate and gradually extends toward the epiphysis until the bone becomes a solid unit. Rickets is an arrest, partial or complete, of this process of cartilage-cell degeneration. In rickets, the cartilage cells retain possession and block the admission of the blood vessels required to carry and deposit the bone-building salts—the calcification.

The severity of rickets, therefore, corresponds to the extent of the cartilage-cell degeneration—upon whether the arrest is partial or complete. Complete arrest of the degenerative process accounts for the grave cases of rickets and partial arrest for the subclinical or inapparent cases. The local symptoms vary accordingly, from the mild rheumatismal cases, which only x-ray examinations can detect, to the pronounced skeletal deformations plainly visible at a glance: enlargement of the carpus, tarsus, fetlock, stifled together with more or less incurvations of the shafts of the long bones, all of which are reactions to avitaminosis D.

The treatment is therefore vitamin D, which increases the absorption of calcium and phosphorus and diminishes the intestinal excretion of them.[1] The diet, unless notoriously calcium-deficient, is not as important as might be supposed. When vitamin D is supplied, blood-serum values tend to become normal regardless of the diet.[2] In animals, cod liver oil of good quality is the drug of choice, although viosterol is the preference of many clinicians.

The need of vitamin D to aid in the utilization of the intake of calcium and phosphorus is no longer questioned. As emphasized by Brennemann,[3] one can build sound bones and teeth no more without this vitamin to lay down the calcium and phosphorus than one can build a good house without good bricks and mortar. The upper limit of tolerance can hardly be overstepped for vitamins in the natural form. While the potentiality for harm from synthetic or extracted concentrates may not have been determined, the danger from their use in proper hands does not exist.

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Nutritional Requirements of Dogs*

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IN A PREVIOUS paper[1] on the nutritive value of commercial dog foods, certain suggestions were made concerning the nutritional requirements of dogs. Some of these were obtained from the meager information in the literature while others were obtained from requirements of other species. The verification of these conclusions on dogs seemed obvious and this paper includes some of the results obtained in such studies.

Food Requirement of Dogs

It was indicated previously that the maintenance prediction values of Brody, Proctor and Ashworth[2] may be applied to the nutrition of dogs. If the values submitted by these investigators as a feeding standard for the maintenance of a wide weight range of animals are stated in terms of dog food, it becomes possible to predict the maintenance requirement of dogs in terms of this widely used article (table I). While a number of factors are involved in the application of any one product to this table, such as moisture, fat and ash content, the predicted figure will be applicable in the feeding of many products. The results obtained in the application of these values to the nutrition of growing and mature dogs is presented.

Procedure

Four dogs (Airedales) were placed on experiment at 6 weeks of age. They were fed twice daily during the duration of the experiment with a canned dog food, previously tested and shown to be a complete diet. Water was supplied in porcelain jars and was available at all times.

One male (No. 6) and one female (No. 7) were started on experiment with allotments of food in accordance with the level predicted in table I. Another male (No. 4) and female (No. 5) were fed at twice the level predicted in table I. The results are graphically presented in figure 1.

Dogs 4 ♂ and 5 ♀ were maintained in excellent condition and grew at a good growth rate for approximately 150 days on a food intake at twice the maintenance level predicted in table I. As the dogs neared maturity, their requirements, expressed in terms of unit body weight, decreased. The food allotment of dog 4♂ was reduced to 1½ the level predicted in table I at 160 days and the food allotment of dog 5 ♀ was similarly reduced at 150 days. The food allotments of dogs 4♂ and 5 ♀ were reduced to 1¼ the predicted level at 185 days. This level maintained the dogs in good health for some time.

Dogs 6♂ and 7 ♀ were allotted food at the level predicted by the maintenance values in table I. Dog 6♂, although the largest pup in the litter, gained only slightly during the first three weeks. The allotment to dogs 6♂ and 7 ♀ was therefore increased to 1½ times the value given in table I at 22 days. There was a marked response to the increased food allotment, as shown by the weight curves in figure 1.

Since dog 6♂ was not growing as rapidly as dog 4 ♂, it was evident that the food allotment to dogs 6♂ and 7 ♀ was still somewhat low. In addition, the pups were quite hungry at meal time. At 59 days, therefore, dogs 6♂ and 7 ♀ were allotted food at 2½ times the maintenance level predicted in table 1, to determine whether the results obtained with dogs 4♂ and 5 ♀, given food allotments at twice the predicted level, could be improved. The dogs gained weight rapidly at the higher level. At 101 days, the food allotments of the dogs were reduced to twice the predicted level, since they were getting rather fat. The intakes of the dogs were reduced to 1½ the predicted level at 175 days.

The results obtained with the four Aire-

*Published with the approval of the director of the Wisconsin Agricultural Experiment Station.

dales therefore indicated that growing pups require about twice as much food as predicted by the maintenance values in table I. The results observed with the older dogs indicate that the values in the table may be slightly low for maintenance. It is important to observe that the results indicate that no single figure, either in terms of dry food or calories, can be predicted for dogs. The amount required by the animal must necessarily vary with the age, weight, and activity.

TABLE I—Food maintenance requirements of mature dogs.

Body Weight (Kg.)	Grams per Animal	Calories per Kg.	Grams per Animal, Fresh Basis (70% Moisture)
1	35.3	141	118
2	58.5	117	195
3	78.7	105	262
4	97.0	97	323
5	114	91	380
6	130	86.7	433
7	146	83.6	487
8	161	80.6	537
9	175	77.8	583
10	189	75.5	630
20	313	62.5	1040
30	423	56.3	1410
40	523	52.3	1740
50	613	49.0	2043

Another variable which complicates the picture is the efficiency of the food being fed. The values in table II list the efficiencies (grams of food per gram gain in weight) of the dog food fed the Airedales, of a grain ration fed to two Danes and of a ration which was a combination of the two. The studies detailed later in this report on the requirements for the antirachitic vitamin required the use of a grain ration (ration 350). The composition of this ration is given in the section on the vitamin D studies. Three of the dogs were fed ration 350 supplemented with 25 to 50 per cent dried canned dog food as a source of vitamin D. The efficiency of this ration may be compared with that of the dog food which was fed without having been previously dried, since it was the sole article of diet. Ration 350, both with and without the dried canned dog food supplements, was fed dry to the dogs *ad libitum*.

The results in table II show that the efficiency of the canned dog food fed to the Airedales (dogs 4 to 7) is comparatively uniform. The ration fed to dog 8 ♀ was slightly less efficient. The efficiency of this ration was favored, since this dog was fed at twice the predicted level given in table I through 175 days and was apparently not getting quite enough food. The values obtained with the Danes can not be compared too closely with those obtained with the Airedales, but it is not surprising that the values obtained with the grain ration show a lower efficiency. The Danes were allowed their food at all times, which is less economical than the food-allotment procedure used with the Airedales. The grain ration was not cooked and was undoubtedly not fully utilized. The efficiency values reported here for the canned dog food are better than those obtained with rats, which have been reported previously.[1] The most favorable efficiency values with the rats were in the range of 3.3 to 4.0 grams of food per gram gain in weight.

The results obtained for the amount of food required by growing and mature dogs agree quite well with the values reported by other investigators. Morgan and Garrison[3] reported that young pups require 200 to 250 calories per kg. of body weight per day, which is supported by our findings. These investigators found that adult dogs required approximately 100 calories per kg. per day for maintenance. These figures are, of course, a less exact way of expressing the requirement than the table, which corrects for the increasing size of the dog.

The results obtained with the Airedales as they matured indicated that the values for maintenance are closely approximated by the table. We have previously indicated that these values agree well with those submitted by DeChambre (quoted by Linton[4]). Emerson[5] was led to state that 80 calories per kg. of body weight per day would satisfy the needs of dogs, which, of course, can apply to only a limited weight range.

VITAMIN D REQUIREMENTS

The literature does not contain any studies directly concerned with the vitamin D requirements of dogs. It has previously been concluded[1] that the vitamin D requirements of dogs are probably similar to those of other species, when compared on the basis of the vitamin D content of the ration. In the following experiments with dogs, confirmatory evidence for this view is presented.

An Airedale (dog 8 ♀) of the litter discussed herein was fed a vitamin-D-low ration[6] supplemented with 25 per cent of dried canned dog food (I). Ration 350 has the following composition:

Yellow corn	59
Standard wheat middlings	25
Crude domestic casein	12
Iodized salt	1
Precipitated calcium carbonate	1
Precipitated calcium phosphate	1
Yeast	1

The dried canned dog food (I) was assayed for vitamin D by the chick-assay procedure[7] and was found to contain 1 International Unit of vitamin D per gram of dry food. Fed to dog ♀ at a 25 per cent level in the ration, the dog food supplied 25 I.U. per cent vitamin D to the ration.

Dog 8 ♀ fed ration 350 supplemented with 25 per cent of dried canned dog food grew from 1.7 kg. to 15.2 kg. in 180 days. Calcification, as indicated by x-ray examinations of the bones, was normal. This dog received 13 I.U. of vitamin D or less per kg. per day. In view of the results submitted by the Fleischmann investigators,[8] it seemed desirable to repeat and extend this finding.

Two Danes (Nos. 14 ♀ and 15 ♂) were fed ration 350 supplemented with dried canned dog food (IV). This supplement was assayed by the chick-assay procedure[7] and contained approximately 0.67 I.U. of vitamin D per gram of food, as found in two separate assays. Dog 14 ♀ was fed ration 350 supplemented with 25 per cent of dried canned dog food (IV). This ration supplied 1.39 per cent calcium, 1.05 per cent phosphorus, 16.7 I.U. per cent vitamin D, and a calcium to phosphorus ratio of 1.32. Dog 15 ♂ was fed ration 350 supplemented with 50 per cent of dried canned dog food (IV). This ration contained 1.87 per cent calcium, 1.34 per cent phosphorus, 33.4 I.U. per cent vitamin D, and a calcium to phosphorus ratio of 1.4. The Danes were placed on experiment at 6 weeks of age.

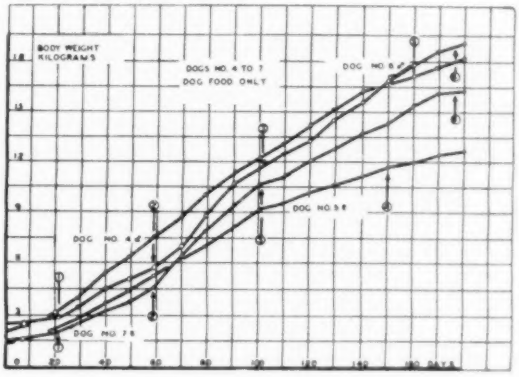

Fig. 1. Growth of dogs 4 to 7 on fresh canned food (I) as the sole article of diet at levels of intake regulated to test the maintenance values submitted in table I. (1. Food intake of dogs 6♂ and 7♀ increased to 1½ times the level predicted in table I. 2. Food intakes of dogs 6♂ and 7♀ increased to 2½ times the level predicted in table I. 3. Food intakes of dogs 6♂ and 7♀ decreased to twice the level predicted in table I. 4. Food intake of dog 5♀ decreased to 1½ times the level predicted in table I. 5. Food intake of dog 4♂ decreased to 1½ the predicted level. 6. Food intakes of dogs 6♂ and 7♀ decreased to 1½ the predicted level.)

X-ray examinations of the bones, and calcium and phosphorus determinations on the trichloracetic acid-blood filtrates[9] aided in determining the degree of protection afforded the dogs by these levels of vitamin D in the diet. The dogs were fed the dry ration *ad libitum*. Water was supplied in porcelain jars and was present at all times. The method of drying the dog food has been previously described.[1]

The records obtained with dogs 14 ♀ and 15 ♂ are shown in table III. The value obtained for calcium on the trichloracetic acid filtrate from whole blood is approximately the value for serum calcium multiplied by 0.65. Both dogs were normal at all times. The male received 25 I.U. of vitamin D or less per 100 grams of ration while the female received 14 I.U. of vita-

TABLE II—Comparative efficiency of different diets for growing dogs.

Dog	Ration	Efficiency, Gm. Food/Gm. Gain	
		0 to 50 Days	0 to 100 Days
4 ♂	Canned dog food (I)	2.0	2.6
6 ♂	Canned dog food	2.2	2.5
5 ♀	Canned dog food	2.2	2.7
7 ♀	Canned dog food	1.9	2.4
8 ♀	Ration 350 + 25% dried canned dog food (I)	2.4	2.9
14 ♀	Ration 350 + 25% dried canned dog food (IV)	3.0	3.8
15 ♂	Ration 350 + 50% dried canned dog food (IV)	2.6	3.2
23 ♀	Ration 350 + 3.7 mg. % irradiated yeast	3.0	3.6
24 ♂	Ration 350 + 3.7 mg. % irradiated yeast	2.7	3.0

min D or less per 100 grams of ration. The results indicated that ration 350 supplemented with dry canned dog food, so that the calcium to phosphorus ratio of the diet would be less than 2.1, was more favorable for calcification in rapidly growing, large-size dogs than the diets employed by the Fleischmann investigators[8] in which the calcium and phosphorus were supplied at a ratio of 2.1.

A second experiment to test this point was conducted. Two heavy-boned dogs, partly Dane, were fed ration 350 supplemented with an irradiated yeast* which contained 5,400 I.U. of vitamin D per gram (rat assay). One of the rations was further supplemented with calcium carbonate. Dog 23 ♀ was fed ration 350 supplemented with 3.7 mg. per cent of irradiated yeast. This ration supplied 0.9 per cent calcium, 0.75 per cent phosphorus, 20 I.U. of vitamin D per 100 grams, and had a calcium to phosphorus ration of 1.2. Dog 24 ♂ was fed ration 350 supplemented with 3.7 mg. per cent of irradiated yeast and added amounts of calcium carbonate (1.5 per cent) in order to increase the calcium to phosphorus ratio to 2.0. The dogs were handled as before. The results are presented in table III.

Dog 23 ♀ was normal throughout the duration of the 125-day experimental period. Calculated on the food intake, the dog received 12 I.U. of vitamin D or less per kg. body weight per day. The results with dog 24 ♂ were more dramatic (fig. 2). This dog rapidly became severely rachitic, as judged by every criterion. The appetite began to decline after 20 days on the diet. The dog was unable to stand for any period of time and rose to a standing position only with difficulty. The animal was flat-footed and markedly bowlegged. The x-rays and the values for calcium and phosphorus in the trichloracetic acid-blood filtrates at 29 days were correspondingly indicative of severe rickets.

Since the results definitely showed that a calcium to phosphorus ratio of 2.0 was less favorable for calcification than one of 1.2 in the presence of limited amounts of the antirachitic vitamin, there appeared to be no reason for continuing dog 24 ♂ on the ration. This dog was consequently shifted to the same ration which was being fed to dog 23 ♀ (ration 350 + 3.7 mg. per cent of irradiated yeast). The food intake of the dog increased immediately. The values for calcium and phosphorus in the trichloracetic acid-blood filtrates was definitely improved at 40 days, although the x-ray at 40 days still revealed severe rickets. The calcium and phosphorus figures at 55 days were somewhat higher than the comparable figures at 40 days.

In order to improve the rate of recovery of the dog, the vitamin D content of the ration was increased to 50 I.U. per cent at 55 days. The x-rays at 65 days showed healing rickets. The decrease in the values for calcium and phosphorus during the later stages of the experiment are probably the same as seen in all dogs as

*We are indebted to Dr. C. N. Frey, Fleischmann Laboratories, New York, for a supply of this yeast and for dogs 23 and 24 used in this experiment.

they mature. The results of this experiment indicated that ration 350 fortified with 20 I.U. of vitamin D per 100 grams supplied sufficient vitamin D to prevent the onset of rachitic lesions.

On this basis our previous minimum figures for calcium and phosphorus may be modified to the optimum figures of 1.2 grams (0.27 per cent) of calcium and 1.0 gram (0.22 per cent) of phosphorus or more per pound of dog food. The phos-

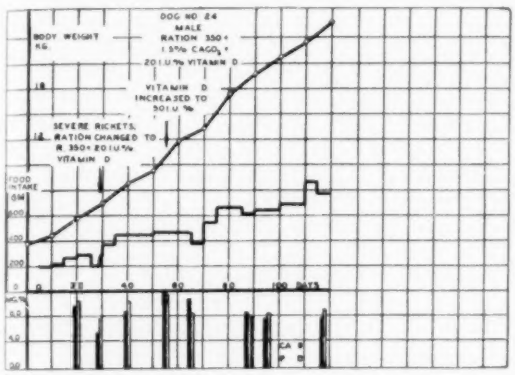

Fig. 2. Record of dog 24♂ started on ration 350 with added calcium carbonate to produce a calcium to phosphorus ratio of 2.0 and supplemented with irradiated yeast (5,400 I. U. of vitamin D per gram) at a level to supply 20 I. U. of vitamin D per 100 gm. of ration.

phorus figures may advantageously be slightly higher when the mineral is supplied by plant sources. In order to supply 20 I.U. per cent of vitamin D, each pound of fresh dog food would have to contain at least 27 I.U. On the basis of the results obtained with these dogs, it appears that the dog, like the rat, utilizes the antirachitic vitamin from liver oils and irradiated food materials equally well.

Mitchell and McClure[10] have reviewed the literature which demonstrates that various investigators have found that the calcium to phosphorus ratios have different optima for various species.

At this point it may be recorded that, since dogs 23 ♀ and 24 ♂ grew well on ration 350 when the latter was supplemented with adequate amounts of the antirachitic factor, it is obvious that 1 per cent of sodium chloride in the diet (dry basis) will satisfy the requirement for this factor. This would require only 1.3 grams of sodium chloride (0.3 per cent) in a pound of dog food.

THIAMIN (VITAMIN B_1) REQUIREMENTS

The investigations of Cowgill and his associates[11] have indicated that the thiamin requirements of mature dogs are satisfied by the administration of 2 I.U. of thiamin per kg. of body weight per day. There are several points in the procedure used by the Yale investigators which are open to question (Williams and Spies[12]). We have, therefore, reinvestigated the requirement for this vitamin.

The basal thiamin-deficient ration (280) had the following composition:

Sucrose	72
Purified casein	18
Autoclaved yeast	4
Steamed bone meal	2
Salts 3	2
Cottonseed oil	1
Cod liver oil	1

The ration may be slightly improved by the addition of sulfited[12] liver extract, fed at a

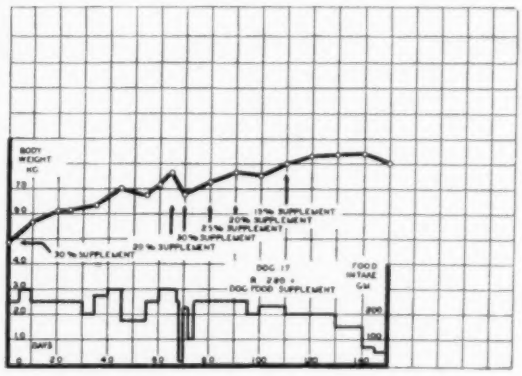

Fig. 3. Record of dog 17♀ fed ration 280 supplemented with dried canned dog food (V) at levels designed to determine the minimum protective level against a thiamin deficiency.

1 per cent level. In this study no liver extract supplement was used, since the dried canned dog food used as the source of thiamin in this study supplied ample amounts of factors in addition to the one being studied. The dried canned dog food (V) was dried in the drying room overnight in accordance with the procedure described previously by the writers. The product

TABLE III—Growth records, trichloracetic acid-blood filtrate, calcium and phosphorus values, and vitamin D intakes of Great Danes 14♀ and 15♂, and smaller Danes 23♀ and 24♂.

Days on Exp.	Body Weight, Kg.				Blood Filtrate								Vitamin D Intake, I. U. per Kg. per Day			
					Calcium, Mg. %				Phosphorus, Mg. %							
	14♀	15♂	23♀	24♂	14♀	15♂	23♀	24♂	14♀	15♂	23♀	24♂	14♀	15♂	23♀	24♂
0	5.85	5.7	3.6	3.75	8.7	7.7			8.7	8.4			14	25	12	10.7
20								9.6				10.7				
25	11.3	11.7	6.5	6.4									11.5	20	11.5	9.4
27					9.1	9.5			8.9	9.1						
29				6.4				5.25				7.5				
40							7.7	8.6			10.2	10.3				
50	17.9	18.8	8.75	9.55									8.0	15	10	9.5
55							9.9	12.0			9.6	11.6				
60					9.4	9.7			7.9	7.2						
65							9.8	10.5			8.1	8.2				
75	24.0	24.0	12.8	14.0									7.0	13	8.8	24
88					8.4	7.2	8.6	8.4	8.4	7.8	7.8	8.0				
95							6.2	7.5			7.6	8.1				
100	28.8	31.5	15.9	18.4									6.5	11	8.8	19
117							7.6	7.0			7.8	9.0				
120					7.6	7.9			7.4	7.7						
125	32.1	36.25	19.4	22.5									5.0	9.0	6.5	15
150	36.8	41.3											5.0	8.3		

was prepared weekly, since it became rancid in the dry state when exposed to the air.

The dried canned dog food was assayed by the chick-assay procedure (Arnold and Elvehjem[13]). The whole dried liver substance was omitted from the basal ration, since it was desired to compare the thiamin requirement of the chick with that of the dog when expressed as per cent of thiamin supplement in the ratio. The thiamin requirement of the chick fed a ration in which the whole liver substance is omitted is approximately 80 micrograms per cent. The results of the assays of the dried canned dog food by the chick-assay method demonstrated that the canned dog food (V) afforded borderline protection, as evidenced by the low rate of growth of the chicks, at a 20 per cent level. This indicated that the dog food supplied approximately 4 micrograms of thiamin per gram.

Two half-grown mongrel pups, previously depleted of their thiamin reserves, were fed the basal ration supplemented with the dried dog food. The ration was fed dry and offered in amounts which permitted growth. Water was supplied twice daily in porcelain cups.

In the records of both of the dogs (figs. 3 and 4) a supplement of 25 to 30 per cent dried dog food to the basal ration supported good growth and maintained the food intake at a high level. The record

which resulted when the basal ration was supplemented with 15 to 20 per cent of the thiamin carrier was somewhat variable. In the case of both of the dogs, however, a supplement of 15 per cent of the dried dog food did not furnish a sufficient amount of the antineuritic vitamin to the basal ration to maintain the food intake of the dogs. This is similar to the results obtained with the chicks. Dogs, therefore, require approximately 80 micrograms per 100 grams of ration to meet the demands for thiamin. This result is in agreement with those previously submitted for rats[14] and chicks.[13] Williams and Spies[12] have independently arrived at a similar conclusion from studies of the diets associated with beriberi.

The thiamin intakes of the dogs related to the body weights may be calculated for the periods during which they received minimal protective amounts of the vitamin. Between 90 and 110 days, dog 17 ♀ was fed the basal ration supplemented with 20 per cent of the dog food, which supplied between 20 and 27 micrograms (7 to 9 I.U.) of thiamin per kg. of body weight per day during the three-week period. Between 15 and 30 days, dog 21 ♂ received a similar level of the dog food in the diet which supplied 26 to 30 micrograms (8 to 10 I.U.) of thiamin per kg. of body weight per day. During periods of growth, as in the case of dog 21 ♂, the food intake and, consequently, the thiamin intake will be higher than during periods of maintenance. Since each pound of dog food contained approximately 135 grams of dry matter, it follows that each pound of fresh food must supply at least 108 micrograms of thiamin to protect the dogs from a deficiency of the antineuritic factor.

OTHER FACTORS

Several notable advances have been made on the vitamins since our previous publication[1] which permit an evaluation of the dog's requirements for some of these factors. The elucidation of the anti-blacktongue factor for dogs[15] has been followed by a series of investigations[16-20] on the nicotinic acid requirement of the dog. These studies have demonstrated that 0.5 mg. of nicotinic acid per kg. of body weight per day is sufficient to cure the symptoms of blacktongue and restore weight. The prophylactic requirement is undoubtedly lower. On the basis of the curative requirement of a 20-kg. dog (10 mg. of nicotinic acid in 313 gm. of dry diet, or 2.3 pounds of a ration which contains 70 per cent of moisture (table 1), each pound of fresh diet should contain 4.3 mg. of nicotinic acid.

The studies on the riboflavin requirements of dogs[21-22] indicate that approximately 25 micrograms of riboflavin per kg. of body weight are required to prevent the onset of yellow livers. A calculation similar to the one used to indicate the minimum nicotinic acid content of diets for the prevention of blacktongue would in turn indicate that each pound of fresh diet must contain 217 micrograms of riboflavin to prevent the appearance of a riboflavin deficiency. Chicks require 290 micrograms per cent of riboflavin during their rapid-growing periods,[23] which is only slightly more than the protective figure submitted for dogs. Calculations on the latter basis indicate that each pound of fresh food diet should contain approximately 0.4 mg. of riboflavin, an amount not difficult to supply under practical conditions.

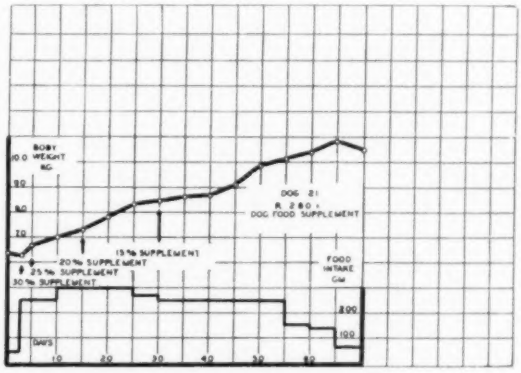

Fig. 4. Record of dog 21♂ fed ration 280 supplemented with dried canned food (V) at levels which provided minimal and subminimal amounts of thiamin for protection against the anorexia associated with a thiamin deficiency.

SUMMARY

Studies with growing dogs have demon-

strated that the total food requirements are approximately twice those required for maintenance. The maintenance values for dogs necessarily are affected by the composition of the ration, and the age and weight of the dog. Values which agreed well with the observed requirements are submitted in tabular form (table I).

Studies on the vitamin D requirements of dogs (Airedales and Danes) indicate that in the presence of a favorable calcium to phosphorus ratio of approximately 1.2, the requirements are essentially similar to those reported for another rapid-growing species, such as the chick. The prophylactic administration of 20 I.U. of vitamin D per 100 grams of ration 350 protected one heavily boned dog from rickets during the duration of the four-month experimental period. Sixteen and seven-tenths and 33.4 I.U. of vitamin D in this ration supplemented with dog food protected two Great Danes from rickets during an experimental period of five months.

Dogs fed a purified thiamin-deficient ration were protected from the anorexia associated with a thiamin deficiency when the ration was supplemented with a thiamin carrier which supplied approximately 80 micrograms per cent of thiamin. This is in agreement with the results previously obtained with rats and chicks.

The requirements of dogs for nicotinic acid and riboflavin are discussed.

ACKNOWLEDGMENTS

The calcium and phosphorus values in the trichloracetic acid-blood filtrates were kindly determined by Mr. H. D. Anderson. Mr. J. R. Wagner, Mr. S. Black and Mr. C. Delwiche have aided in the care of the dogs at various times.

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In- or E-volution?

Comes a report from the University of Witwatersrand, South Africa, that a boy now 12 years old was raised by baboons—the first non-fiction Tarzan.

When an old Iowa veterinarian accustomed to being routed out of bed at all hours of the night retired from practice, he hired the night watchman of the neighboring factory to call him up several times every night so that he could conscientiously roll over and tell the telephone to go to the devil.—*Personal communication.*

Infectious Gastroenteritis of Cats*

By the late C. E. SALSBERY, D.V.S.
Kansas City, Mo.

DISEASES of cats have held little interest for the majority of veterinarians. The subject seldom has found a place in the discussions of animal diseases at any of our meetings. Other subjects of interest to the small animal practitioner, such as distemper, running fits, canine typhus, rabies and mange, have each received a liberal proportion of our time on such occasions. It seems strange that a disease affecting one of our most common and useful household pets should have aroused so little concern, especially when it is realized that the disease has been so universal and has a mortality of approximately 100 per cent. It is known that breeders of cats, as well as those who keep them for practical as well as sentimental reasons, have frequently suffered acute losses as the result of infectious gastroenteritis. Epidemics of this malady have swept whole communities, practically decimating the entire young cat population.

Recent developments in relation to its true etiology, the same as in canine distemper and equine encephalomyelitis, and the consequent possibility of being able better to control it and treat it successfully warrant a thorough consideration. It is true that investigations into the nature of the cause of canine distemper and equine encephalomyelitis have not altered the characteristics of these diseases. But they have changed our aspect of them so that we now consider them from different angles, since a more definite knowledge of their etiology, modes of transmission, control and management opens new avenues of approach hitherto impossible because of the absence of such information. Thus it may be with infectious gastroenteritis of cats.

It shall be the purpose of this discussion to review the important information bearing upon the recent investigations into the etiology of this disease; to point out what has been discovered with regard to the application of this information in attempting to find a means of controlling it by the use of more effective sanitary measures; and to discuss the possibility of immunization of susceptible animals and the treatment of those already infected. Before entering into these phases of the subject, however, it may be of interest to review briefly earlier investigations, which undoubtedly lead us astray in our endeavors to treat and control this very serious disease of cats.

Our first encounter with infectious gastroenteritis was in 1915, when our laboratory first began to receive material for laboratory diagnosis. Sick cats, dead cats, and tissue specimens were studied, with the result that we decided that an organism of the *Bacillus coli* type, if not actually that organism, was responsible for the disease. Other bacteria were encountered, but the apparent constant presence of the *B. coli* satisfied us that it must be the actual exciting agent. Information already in print indicated that the same organism undoubtedly had been found by others. Likewise, Zschokke[1] in 1900 attributed the disease to *B. coli* of exceptional virulence. Skrzynski[2] in 1908 reported the same organism as having a definite relation to the disease. Milks and Goldberg,[3] 1919-1920, believed a variety of *B. coli* was the cause and presented considerable data to prove such a relationship. Robin,[4] 1928, isolated a *B. coli* type organism from sick cats.

Other investigators reported finding various types of organisms associated with the disease, but more recent investigations have shown that another agent is the primary cause. The first definite data involving a filtrable virus came from the investigations of Verge and Christoforoni[5] in 1928. They reproduced the typical disease with filtered (Berkefeld) extracts of organs of dead cats and concluded that an

*Presented at the annual meeting of the Southern States Veterinary Medical Association, Knoxville, Tenn., November 3-5, 1938.

ultramicroscopic agent was the true cause of the gastroenteritis which they described.

Hindle and Findlay[6] in 1932 attempted to reproduce the disease by inoculating susceptible cats with a variety of suspected microörganisms and concluded these were, at the most, only secondary agents. They did succeed, however, by the use of filtered (Berkefeld) nasal material and organ extracts from diseased cats. It seems probable that these men were working with a mistaken idea in that they referred to the disease as feline distemper. Finding a virus in the nasal washings as well as in organ extracts would indicate that they were working with both diseases and laboring in the belief that the two were one and the same. Their description of the cases under investigation, nevertheless, are quite typical of gastroenteritis, even though referred to as distemper. An extract from their published work would suggest the truth of this statement.

> The clinical symptoms of this disease were found to be so variable as to offer no certain method of clinical diagnosis, but pathologically there is constantly present some degree of congestion of the alimentary canal. This congestion is usually restricted to the small intestine, sometimes to only a short length of it, but in other cases it may extend along the whole length of the small intestine, the stomach and even the esophagus. Enlargement and congestion of the abdominal lymph glands are generally observed and, in addition, enlargement of the spleen, bronchopneumonia, pleurisy and peritonitis may occur.

Kirk[7] points out that while some of these conditions may be observed in distemper, the absence of any mention of such common and characteristic symptoms as coryza, rhinitis, sneezing, and salivation would indicate that the disease Hindle and Findlay investigated was, in fact, gastroenteritis and not distemper and that the virus they report finding was the one associated with the former and not the latter disease. Urbain[8] in 1933 found a filtrable virus in his studies on gastroenteritis. Leasure, Lienhardt and Taberner[9] in 1934 found a filtrable virus to be the cause of infectious enteritis of cats. More recent investigations of our own proved that filtered (Berkefeld) organ extracts from diseased cats reproduce the typical disease. From these investigations, therefore, there appears to be no doubt that the actual exciting cause of infectious gastroenteritis of cats is a filtrable virus and that the other organisms associated with it are present merely as secondary invaders.

OCCURRENCE

Infectious gastroenteritis attacks primarily kittens and young cats, although older cats are sometimes susceptible. It is presumed that an acquired immunity exists in older cats as a result of exposure of insufficient intensity to produce the disease in a clinical form. It is probably analogous to the immunity against distemper in old dogs. The disease is quite widespread in this country, often assuming an epizoötic form and sweeping through an entire community with the virtual destruction of the entire young cat or kitten population. At other times it may be confined to smaller areas.

A certain neighborhood in Kansas City, covering an area of several blocks, lost nearly all of the younger cats as a result of gastroenteritis. European countries, especially Great Britain, have been extensively invaded. It is reported that during 1919 to 1922, at least 1,000,000 young cats were destroyed in Great Britain alone. The disease was described in India more than 50 years ago as Asiatic cholera of cats. It usually occurs during mild weather, particularly when it is chilly, raw, and wet. Most cases are seen in the spring or autumn, seldom occurring during intensely cold weather or during hot, dry summers.

SUSCEPTIBILITY

Kittens from 3 to 4 months of age are the most susceptible. Young cats from 8 to 9 months of age occasionally may be attacked, while adult or older cats are rarely susceptible. Dogs, rabbits, guinea pigs, mice, ferrets, and man appear to be wholly resistant. Knowing the high susceptibility of ferrets to the virus of canine distemper and that of guinea pigs to the virus of equine encephalomyelitis, it was presumed

that these animals, especially ferrets, might be susceptible to the virus of gastroenteritis. Repeated attempts to infect these animals by inoculation experimentally failed.

CHARACTERIZATION

Infectious gastroenteritis of cats should be recognized as a highly infectious and contagious disease characterized by high temperature, great depression, illness of short duration, rapid and extreme emaciation, and high mortality resulting in the death of many animals over a short period of time and spreading rapidly.

TRANSMISSION

The disease is transmitted by contact, but this is not essential. Infection occurs in cats that have had no opportunity to contact sick ones or infective material where sick cats were kept, although contact with such material is known to be a source of infection. Undoubtedly, flies are a means of spreading the virus. Kirk[7] made the observation that when a fly pest abated, the incidence of enteritis diminished accordingly. Carelessness in handling sick animals on the part of attendants and others may be a means of transmitting the virus to healthy animals. Thoughtless interchange of utensils and other equipment between sick and well cats is another means of transmission.

SYMPTOMS

The symptoms of infectious gastroenteritis may be so vague and indefinite at times, especially in the peracute cases, that one may be confused and inclined to believe with the owner that the animal has been poisoned. The fact is that often these cases show practically no symptoms at all. Often, kittens die before the veterinarian has had an opportunity to make a satisfactory observation. Those cases which live long enough to present the usual symptoms are characteristic. The temperature reaction is most significant. It usually reaches its maximum elevation between the fifth and eighth day after exposure and death usually occurs from the first to the third day following the maximum elevation.

Along with the initial elevation of temperature, inappetence occurs and all food is refused. Roughness of the coat is ap-

parent, depression is noted, and the cat is indifferent to the presence of attendants and even its master. Emaciation is pronounced and progresses rapidly. At first there is constipation, which may or may not be followed by diarrhea. It has been our observation that diarrhea occurs most frequently in the younger patients. Sometimes the stools may be tinged with blood.

During the early stages vomiting often occurs, especially in the event of excitement or if the animal attempts to drink water. There is decided weakness and unsteadiness when the cat is forced to stand. Intense soreness in the abdomen is evidenced by manipulation, or, if the patient is lifted by placing the hands about the abdomen, it cries as if in great agony. A peculiar and characteristic position is assumed. Lying flat on its abdomen with the forefeet spread laterally—its head lowered, frequently hanging over the edge of the water pan or resting its nose on the floor of its cage—is the characteristic position in which the animal appears to be most comfortable. If vomiting occurs, the vomit is frothy and of a bright yellow color. Death is the usual termination in these cases—a mortality of 80 per cent to 90 per cent—and occurs within 48 hours.

MORBID ANATOMY

In the most acute cases postmortem examination may reveal little or no pathological change. Considering the disease as a whole, however, quite definite lesions are observed. The principal changes appear in the small intestine. The second division of the small intestine, the jejunum, and the third division, the ileum, are most commonly affected. The intensity of the inflammation varies. In some cases only simple congestion is noted, while in others there may be diphtheritic inflammation with the formation of pseudo-membranes, hemorrhage, and necrosis. These lesions are seen in about 50 per cent of the cases.

The lesions are not always confined to the small intestine, occasionally extending into the large intestine and stomach. Sometimes altered blood is found in the stomach and intestine. The wall of the gut is often thickened because of edematous infiltration. The serous coat may be markedly congested, and peritonitis is not uncommon. Bile pigment is seen frequently in the intestinal tract, and the tissues adjacent to the gall bladder may be stained with bile. The lymph glands, especially the mesenteric nodes, are congested and infiltrated. Slight swelling and congestion of the spleen and liver are not uncommon. The kidneys may show congestion and occasionally be edematous. The lungs present no constant lesions.

Myocardial degeneration is noted in practically all cases but no hemorrhages have been observed. Petechial hemorrhages may be observed in the mucous membrane of the bladder. Other minor lesions are sometimes present but they are quite variable.

DIFFERENTIAL DIAGNOSIS

There are possibly three diseases to be differentiated from feline gastroenteritis, namely: contagious ulcerative glossitis, influenza, and feline distemper. The latter is most likely to be confused with gastroenteritis.

Contagious ulcerative glossitis is considerably less fatal. It attacks cats of all ages. It is characterized chiefly by lesions on the tip and edges of the tongue. At first there is inflammation and, later, ulceration. Always the anterior third of the tongue is affected. With proper treatment most of these cases recover.

Cat influenza is more or less common among boarders. It spreads rapidly to all cats in the same quarters and sneezing is the evidence of it. Salivation is one of the common symptoms. There is a mucous discharge from the nose, which later becomes mucopurulent. The throat is sore and congested; there is no vomiting; the eyes are congested; and there may be lacrymation. Recovery usually occurs with proper treatment. Adult cats primarily are affected with this disease.

Feline distemper is more or less the same as influenza at the onset, except that it is much more severe. The nasal discharge is the essential differentiating char-

acteristic. It is more profuse and has a greenish appearance. The eyes are also much more severely affected. The chief symptoms are prostration, sneezing, salivation, profuse mucous nasal discharge, loss of appetite, high temperature, and bronchitis and pneumonia. Intense conjunctivitis, with swelling which protrudes between the eyelids, is common. Diphtheritic deposits appear on the conjunctiva and the lids become adherent, completely obstructing the vision. There may be intestinal involvement but it does not assume the characteristics observed in enteritis. The mortality is about 25 per cent.

TREATMENT

In the past, numerous attempts have been made to control this disease by the use of vaccines prepared from cultures of the various organisms isolated from affected cats. It has been reported that beneficial results were obtained in some instances but it is now evident that such results could not have meant more than a stimulation of resistance against the secondary infection, and in no respect increased resistance against the filtrable virus.

Recalling the successful use of tissue emulsions treated with formalin in other filtrable virus diseases, Urbain[8] utilized formalin-treated emulsions of spleens obtained from cats affected with gastroenteritis. A procedure similar to that used in preparing canine distemper vaccine, rabies vaccine, and other analogous vaccines was followed. One gram of spleen to 10 cc. of physiological saline was the proportion used in preparing the vaccine. Spleens removed aseptically from affected cats were weighed and ground in a sterile mortar with a pestle and sterile sand. Sufficient sterile physiological saline was added to make a 10 per cent suspension to which was added sufficient formalin to make a 2-parts-per-1,000 solution. This was allowed to stand for 48 hours at room temperature, tested for sterility, and injected in doses of 2 cc.

It was found that two doses at five-day intervals produced a solid immunity against fatal exposure to the virus, which was shown by the death of susceptible cats subjected to the same exposure. Repeated tests were made with the same results in each instance. The subcutaneous injection of the vaccine produced only slight redness and edema which disappeared rapidly.

More recently, Leasure, Lienhardt and Taberner[9] of Kansas State College confirmed the results reported by Urbain[8] by utilizing a vaccine prepared in the same manner. Still more recently, similar results were obtained in our own laboratories and it seems probable that a solid immunity may be produced by the injection of a single dose of the vaccine. Cats vaccinated with the formolized tissue emulsion have withstood exposure by artificial infection; by contact with infective material as well as by eating food contaminated with the egesta of sick cats. Such exposure in all cases produced the disease in unvaccinated susceptible cats.

A homologous antiserum, produced by hyperimmunizing immune adult cats with a series of injections of the virus, was found to be effective in protecting susceptible cats against a simultaneous exposure to the virus. Experiments to demonstrate the effectiveness of a simultaneous vaccination similar to the use of serum and virus against hog cholera were conducted successfully. Susceptible cats given from 5 cc. to 10 cc. of homologous serum and 3 cc. to 5 cc. of the virus emulsion simultaneously remained well while controls succumbed to the typical disease.

Attempts to produce a heterologous antiserum have been only partially successful. Such a serum was produced by hyperimmunizing a mule. Definite protection was shown in 66 per cent of the vaccinated cats. About 50 per cent of the cats, however, developed abscesses at the site of injection of the serum.

Obviously, the commercial production of a homologous antiserum is rather impractical because of the large number of cats required and other features which would make such a procedure objectionable. It may be found possible to improve the heterologous product by increasing the potency

of it and by neutralizing its lytic properties.

Several lines of treatment have been advocated for the relief of sick cats. Frick recommends the following formula:

Lime water, 8 oz.
Cod liver oil, 8 oz.
Bismuth subnitrate, 1 oz.
Methyl salicylate, 1 dr.
1-oz. doses to be given *ad lib.*

Blount recommends the following isotonic solution:

Sodium chloride	40.0 gr.
Potassium chloride	1.9 gr.
Calcium chloride	1.0 gr.
Sodium bicarbonate	0.7 gr.
Neutral sodium phosphate	1.0 gr.
Glucose	5.0 gr.
Water	10.0 oz.

The dosage of the above is 1 to 2 ounces of warm solution.

Kok and others recommend the intravenous injection of 40 per cent formalin. The dosage is 3 to 4 drops in solution with 4 cc. of physiological saline.

SUMMARY

1. Infectious gastroenteritis of cats is due to a filtrable virus.

2. The virus is found in the brain, spleen, kidneys, urine, feces, and blood.

3. The incubation period in artificial infection is one to six days.

4. In natural exposure it is four to ten days.

5. Cultivable organisms isolated from sick cats are secondary invaders and are not capable of reproducing the disease.

6. Young cats are most susceptible. Cats more than 2 years old are highly resistant.

7. Cats alone are susceptible to the virus.

8. Successful immunization has been accomplished with formolized emulsions of spleen tissue obtained from cases of infectious enteritis.

9. An effective homologous antiserum may be produced by hyperimmunizing immune cats.

10. The use of a heterologous antiserum has not been entirely satisfactory.

11. The course of the disease is acute or peracute and the mortality is 80 per cent or more.

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A Virus Disease of Cats

An acute, highly fatal epizoötic of cats, which can be recognized by a fulminating and extreme leukopenia involving all types of white blood cells, aplasia of the bone marrow, including both the granulocytic and erythrocytic, aplasia of lymphoid tissue and characteristic nuclear-inclusion bodies in the cells of the intestinal mucosa and in certain cells of the spleen, lymph nodes and bone marrow, has been induced in healthy cats by means of a bacteria-free filtrate of emulsions of the spleen of infected animals.

Leukopenia developed prior to other changes in most cases and, therefore, the primary injury was considered to affect the blood-forming organs.

Intestinal lesions, although constant, vary in severity and extent. The actual cause of death has not been determined. Evidence seems to support the conclusion that the disease is due to a filtrable virus. The natural disease is highly contagious and remains viable outside the body for a considerable period of time. *(A Virus Disease of Cats Principally Characterized by Aleukocytosis, Enteric Lesions and the Presence of Intranuclear Inclusion Bodies. By William D. Hammon and John F. Enders. Jour. Exp. Med., lxix (1939), p. 327.)*

Parasitic otorrhea may be a cause of hysteria in dogs; it is a frequent cause of convulsions in cats.—*Milks.*

The Physiology of the Reproductive System of the Fowl*

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THE DIRECT economic importance of poultry lies in the production of two things, namely, meat and eggs. Under natural conditions in the wild state, the ancestors of the domestic fowl produced relatively few eggs. It is highly probable, however, that the wild progenitors of our domestic poultry possessed the potential ability to lay many more than the usual number of eggs. Under the conditions of domestication, the intensive feeding and the practice of removing the eggs as fast as they are laid, along with selective breeding, the physiological function of egg production has been developed to a very high degree.

DESCRIPTIONS OF THE REPRODUCTIVE ORGANS OF THE MALE

The reproductive organs in both the male and female are called "gonads." The male fowl possesses two testes, situated in the abdominal cavity along the back near the anterior ends of the kidneys. In birds the testes enlarge in size and weight during the spring and early summer—the breeding season. This is also true of the domestic fowl. In migratory birds the genital organs increase greatly in size in both sexes as the spring period of migration approaches. This is thought to be one of the primary reasons for migration. When the birds are ready to migrate again to their winter quarters, the genitals atrophy and assume a quiescent state. It has recently been shown that these effects can be produced experimentally by increasing the light ratio by strong electric light. They are therefore probably caused by changes in the length of the day. The testes never descend into an external scrotum, as in the case of most domestic mammals.

From each testis there is a tube, called the vas deferens, leading to the cloaca. At the base of each vas deferens, or just before it opens into the cloaca, there is an enlargement, called the "seminal vesicle," which functions as a reservoir for holding the sperm.

The testes are more or less ellipsoid in form and are of a light yellow color. Frequently they exhibit a reddish cast caused by the numerous blood vessels on the surface. There is a tendency for the right testis to be larger than the left.

The testes are covered by peritoneum, under which is a dense fibrous capsule, the "tunica albuginea." The glandular elements consist of a large number of very slender, much-convoluted ducts, the seminiferous tubules, which form the reproductive cells of the male, the "spermatozoa." Fine trabeculae are given off from the tunica albuginea and extend inward into the substance of the gland, separating groups of seminiferous tubules.

In birds there is not, properly speaking, an epididymus. The seminiferous tubules all lead eventually to the vas deferens, which proceeds from within the posterior extremity of the testicle and is directed in a tortuous manner backward, draws near the ureter on its own side, going along the kidney with it, and opens into the cloaca in a small papilla which serves as an intromittent organ. There are two penes in the fowl. The base of each papilla is surrounded by a plexus of blood vessels which serve the purpose of erectile tissue. In the drake, gander and swan a long, single penis is developed. As stated before, at the base of each vas deferens, just before it opens into the cloaca, there is an enlargement which is called the seminal vesicle.

REPRODUCTIVE CELLS OF THE MALE

The reproductive cells of the male, spermatozoa, are secreted in the testes by the

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seminiferous tubules. Next to the basement membrane of the tubule is found a layer of cuboidal cells, the spermatogonia. These multiply and a portion of the new cells push inward to form the primary spermatocytes. By division of the primary spermatocytes, secondary spermatocytes are produced, and the number of chromosomes is reduced to one-half in preparation for union with the egg cell.

In the reduction division or maturation the chromosomes do not split. Instead, similar chromosomes pair up and then separate from each other in such a way that when the cell containing them divides to form two new cells, only one member of each pair is found in each of the new cells. Each of these daughter cells, therefore, contains half the number of chromosomes that the parent cell carried. This number is referred to as the reduced or haploid number.

After the reductional or maturation division the germ cells are called secondary spermatocytes. These divide once more by mitosis to become spermatids. The spermatid elongates and the nucleus moves to one end, forming the head. The spermatozoa attach themselves, for some time after forming, to the free end of the tall columnar cells lining the seminiferous tubules, which are called Sertoli cells. These Sertoli cells are attached to the basement membrane and are thought to supply nourishment to the spermatozoa. Spermatozoa are continuously being produced and shed by the seminiferous tubules.

A spermatozoön consists of a head which carries the nucleus containing the chromosomes, a neck which contains the centrosome from the parent cell or spermatid, and a long vibratile tail, which serves as a propeller, by means of which the sperm moves about in the seminal fluid or travels along the mucous lining of the oviduct after mating has occurred.

REPRODUCTIVE ORGANS OF FEMALE BIRDS

The reproductive organs of female birds, and especially the domestic hen, are among the most complicated. They function not only to produce the ovum but also to provide a protective envelope for protection and nourishment for the embryo when growth subsequently takes place. As the ovum or egg develops after it is outside the body of the parent, this elaborate protection is necessary to preserve it in its original form.

The female generative organs consist of a single ovary and an oviduct, which is situated in the left sublumbar region of the abdominal cavity adjacent to the backbone and just at the anterior extremity of the left kidney.

In early embryonic life there are two gonads in the female, as in the male. Normally only the left one develops, however. Occasionally a rudimentary right oviduct is present. Gallagher[1] observed a right oviduct, in an active laying hen which was nearly as long as the left and equally voluminous. Its anterior extremity exhibited an infundibular membrane in contact with the ovary. Posteriorly it opened into the cloaca opposite the left oviduct. The appearance of the mucous membrane suggested that it was capable of functioning.

According to Kaupp,[2] all oöcytes that the ovary is capable of producing are present in the ovary at the time the chick is hatched. The production of new ova was formerly thought to cease after birth in mammals. In 1923, Allen[3] attacked this theory, claiming that in the mouse new ova are formed from the germinal epithelium at each heat period; in other words, claiming that ovogenesis is a continuous process throughout sexual life, just as is spermatogenesis in the male. Continuous ovogenesis in adult life is now claimed for the mouse, rat, guinea pig, dog, cat, monkey and man. The demonstration of continuous ovogenesis in adult life in such a wide range of animals would tend to indicate its occurrence in all mammals. This has not been proved for birds.

The functioning ovary in a hen appears as a cluster of many yellow or reddish-yellow spheres, which vary in size from that of a normal yolk down to a size which is not visible to the unaided eye. The oöcytes are small, whitish spheres, which

represent undeveloped ova and which in the active state are developed one by one into yolks with their blastoderms. From the blastoderm the fetus or baby chick may later be developed. Each ovum or yolk, as it develops, is enclosed in a fibrous capsule or follicle, which is attached to the ovarian body by means of a delicate, white, fibrous pedicle or stalk. In the active ovary of the laying hen the ovarian mass is of considerable size, as it contains ova in various stages of development. Only one ovum is completely developed at a time, although occasionally there may be only a few hours elapsing between the maturity of successive ova. The ova receive nourishment from blood vessels of the capsule. These vessels are branches of the ovarian artery.

Pearl and Schoppe[4] found that, in general, the mean number of visible oöcytes of different kinds of birds reflects the normal fecundity of laying activity of the same kinds of birds.

Ovulation in the bird is brought about by the rupture of the follicle along a short line or band called the stigma, which marks the extremities of its vascular system. This occurs when the ovum becomes mature and allows the ripe ovum to escape into the oviduct. The empty sac or follicle then shrinks and finally disappears.

Pearl and Schoppe[4] in 1921 and Domm[5] in 1927 showed that removal of a part of the ovary is followed by prompt regeneration until the gonad is restored to its usual or normal size for the individual. It has also been suggested that regeneration is accompanied by increased ovulation so that the end result of partial ovariotomy is greater egg production. However, Hutt and Gussendorf[6] in 1933 concluded from a carefully controlled experiment that the effects of partial ovariotomy in 8-week-old White Leghorn pullets were deleterious in some cases, harmless in others, but beneficial or stimulatory in none.

GERM CELLS OF THE FEMALE

Like the reproductive cells of the male, the germ cells of the female pass through three stages. According to Lillie,[7] the first stage, or period of multiplication, is embryonic and ends about the time of hatching. Pearl and Schoppe,[4] however, have shown that by the surgical removal of a considerable portion of the ovary of adult females, the number of oöcytes developing to visible size is increased from 33 to 68 per cent, following regeneration of the ovary, over the number which develop in the normal unoperated birds. Whether this means that the multiplication stage is reëntered, or simply that a large number of oögonia (as the ova are called before growth) are stimulated to enter the growth stage, has not been definitely established. It may indicate a possibility of a continuous ovogenesis, as was demonstrated in mammals.

The multiplication period of the germ cells is followed after hatching by a growth period, which continues throughout the laying life of the individual. Ova in this stage are referred to as oöcytes. Oöcytes are formed during embryonic life, beginning about the 14th day of incubation. The oöcytes grow very slowly by the deposition of light yolk, until they reach a diameter of about 6 mm. While the hen is in a laying cycle, some of the small oöcytes, but only a few at any time, are constantly coming into a state of physiological activity. These begin to grow at an enormously increased rate by the deposition of yolk, until finally they are of the full size for laying. The material of the yolk is conveyed to the ovum from the highly vascular follicle. According to Gerhartz,[8] the time required for this final growth of yolks preparatory to laying is about 20 days on the average.

It is of interest to note that in the case of the female germ cell the maturation divisions are decidedly unequal, in contrast to the male germ cell, in which the maturation divisions are equal. In the first and second divisions the yolk material does not divide. Only the germ spot divides, with the result that, with each division, all of the yolk mass is found with one daughter cell, while the other is yolkless. The yolkless daughter cell from the first division is called the first polar body and that from the second division, the second polar body.

Both polar bodies disintegrate and disappear.

THE OVIDUCT

The oviduct of the hen is a large tube, white or whitish pink, which starts at a point just below the ovary and ends at the cloaca. The oviduct is tortuous in its course, forming three principal convolutions before reaching the cloaca. The active organ becomes very much enlarged, pushing the abdominal viscera downward and to the right side. It is about 70 to 85 cm. in length and is covered with a fine network of blood vessels, which give it a pinkish color.

The wall of the oviduct consists of three layers. The outer layer is the serous coat, which is a reflection of the peritoneum. The middle layer is the muscular coat, composed chiefly of smooth muscle and connective tissue and consisting of an outer longitudinal and an inner circular layer of muscle. The inner layer consists of a mucous membrane, which in the resting state is thrown into folds.

Divisions of the Oviduct—The oviduct is divided into five main divisions, which may be distinguished by gross observation. These divisions are the infundibulum; the albumin-secreting portion or magnum; the isthmus, where the shell membranes are formed; the uterus, where the shell is formed; and the vagina.

The beginning of the oviduct is the funnel-shaped or trumpet-shaped portion, the ostium tubae abdominale. The mouth or fimbriated opening faces the ovary and lies ventral to it to receive the ovum or yolk as it is discharged from the ovary. The thin wall, expanded in the anterior portion, is provided with fimbrae-like projections. It is said that, when the ovum is about to be discharged from the ovary, these fimbriated lips or margins of the funnel envelop that portion of the ovary or the follicle, so that the ovum may certainly pass into the oviduct. However, some investigators are of the opinion that the egg is first expelled into the abdominal cavity and then picked up by the funnel of the oviduct. The funnel portion of the oviduct is about 3 to 4 cm. in length.

The second division of the oviduct is the albumin-secreting portion, or, as it is commonly called, the magnum. The funnel-shaped portion gradually merges into the second portion. The walls of the albumin-secreting portion are much thicker. This section is the longest of the five divisions and measures from 40 to 42 cm. in length, or about one-half the length of the entire oviduct.

The third section is the isthmus. The albumin-secreting portion terminates quite abruptly into the isthmus, which is 3 to 5 cm. in length.

The fourth division of the oviduct is the uterus, or shell-gland-secreting portion. The uterus is about 15 to 20 cm. in length. There is not a clear line of demarcation between the isthmus and the uterus, the walls gradually expanding to form the uterus.

The fifth division of the oviduct is the vagina. At the junction of the shell-gland portion and the vagina there is located a strong sphincter muscle. The vagina is that constricted portion of the oviduct extending from this muscle to the cloaca. The vagina of the hen of average size measures 12 to 14 cm.

Supporting Structures—The oviduct is held in position by two ligaments, one dorsal and one ventral. The dorsal ligament is formed by a double layer of peritoneum and contains a small amount of connective tissue and muscle fibers, which become continuous with the circular muscle fibers of the oviduct. The dorsal ligament maintains a line of attachment to the body wall from the caudal end of the abdominal cavity to the fourth thoracic vertebra. The ventral ligament of the oviduct of a laying hen consists largely of a muscular cord, 3 to 6 cm. in diameter, and has a free ventral border. The muscular tissue of the ventral ligament is also continuous with the circular muscle of the oviduct. Curtis[9] observed that there was a great disproportion between the amount of musculature in the walls of the oviduct, except in the uterus and vagina, and the degree of physiological

activity of the organ. It seems probable that the muscle within the ligaments, which is especially abundant at the caudal end of the ventral ligament, may assist in the movement of the egg along the duct.

The Mucous Membrane—The mucous membrane constitutes, from a physiological standpoint, the most important structure of the oviduct, since it is from the glands contained therein that the albumin, shell membranes and shell are derived.

If the mucous membrane is examined by the naked eye, it will be seen that it is thrown into folds which extend in a longitudinal and slightly spiral direction. Secondary folds extend from the sides of these longitudinal or primary folds. The secondary folds are most highly developed in the albumin-secreting portion. In the uterus the primary folds become leaf-like and of considerable length, extending into the lumen, thus affording greater cellular surface. In the vagina the mucous membrane forms low, narrow folds, with secondary folds which appear continuous with those of the uterus or shell-gland-secreting portion.

The epithelial layer of the mucous membrane is made up of glandular cells which are of two kinds and consist of ciliated columnar cells intermixed with goblet cells in about equal proportion. In the first part of the infundibulum, however, the goblet cells are apparently absent, this region being lined by the ciliated columnar cells only.

GLANDS OF THE FEMALE

Three types of glands are described. (1.) Unicellular epithelial glands or goblet cells occur between the ciliated cells in all parts of the oviduct except the anterior portion of the funnel. Histologically, these unicellular glands present a similar appearance in all parts of the oviduct, except the vagina. In this region the cells are longer and much narrower. The unicellular gland cells are more numerous at the mouths of the ducts leading from the tubular glands. The nuclei of these cells are round. (2.) There is an accumulation of gland cells at the bottom of the grooves between the secondary folds of the epithelium. These are called the glandular grooves. (3.) The tubular glands consist of long convoluted and branched tubules which open to the lumen of the oviduct by short ducts lined with epithelium. The glands are formed by an indipping of the epithelium. These glands are similar in structure to the glandular grooves of the funnel portion. The tubular glands reach their greatest development in the albumin-secreting portion of the oviduct.

The walls of the tubular glands consist of large gland cells which, in the albumin-secreting portion and the isthmus of the oviduct in a laying hen, have small, dark-staining, irregularly shaped nuclei lying well towards the basal ends of the cells. In these two regions the protoplasm of the cells contains rather coarse granules, which vary in size.

The line of demarcation between the albumin-secreting portion and the isthmus is characterized by the absence of the tubular glands in that region.

In the uterus the cells which form the tubular glands have a slightly different appearance. The nuclei of these cells are large, with regular outlines, and are situated near the center of the cells. The protoplasm of the cells contains fine granules in place of the coarse granules in the cellular protoplasm of the tubular glands of the other regions.

The tubular glands are entirely absent from the vagina. Only the unicellular epithelial glands occur here.

ACQUISITION OF ALBUMIN BY THE EGG

According to Pearl and Curtis,[10] the acquisition of albumin by the egg is described somewhat as follows:

> After entering the infundibulum (funnel) the yolk remains in the so-called albumin-secreting portion of the oviduct about three hours, and in this time acquires only 40 to 50 per cent by weight of its total albumin. During its sojourn in the albumin portion of the duct the egg acquires the chalazae and chalaziferous layer, also the dense albumin layer and the inner layer of albumin, if such layer exists as a dis-

tinct entity, about which there is some doubt.

Almquist and Lorenz[11] have offered conclusive evidence of the existence of an inner fluid layer of albumin. They have estimated that, on the average, from 50 to 60 per cent of the albumin is in the firm layer, the remaining 40 to 50 per cent being distributed about equally between the outer and inner liquid layers.

The outer layer of albumin is secreted in the isthmus and uterus sections of the oviduct. About five to seven hours are required for this process, which is described by Pearl and Curtis[10] as follows:

> Upon entering the isthmus, the egg receives its shell membranes. In passing through this portion of the duct something under an hour is occupied, instead of three hours, as has been previously maintained. At the same time, and during the sojourn in the uterus, it receives its outer layer of fluid or thin albumin, which is by weight 50 to 60 per cent of the total albumin. This thin albumin is taken in by osmosis through the shell membranes already formed. When it enters the egg in this way it is much more fluid than the thin albumin of the laid egg. The fluid albumin added in this way dissolves some of the denser albumin already present and so brings about the dilution of the latter to some degree. At the same time, by the process of diffusion, the fluid layer is rendered more dense, coming finally to the consistency of the thin layer of the laid egg.
>
> The addition of the albumin to the egg is completed only after it has been in the uterus from five to seven hours. Before the acquisition of albumin by the egg is completed, a fairly considerable amount of shell substance has been deposited on the shell membranes. For the completion of the shell and the laying of the egg from twelve to sixteen and even more hours are required.

This manner of deposition of albumin through the shell membranes by osmosis is difficult to correlate with our present ideas regarding the behavior of colloidal materials and permeable membranes, and it seems not unlikely that the dilution of the albumin is due simply to an addition of noncolloidal fluid.

THE HEN'S EGG

Amundson[12] made some observations on a hen, before and after an operation in which nearly one-half of the isthmus was removed, and concluded that even one-half of the isthmus is capable of forming normal shell membranes and that the isthmus influences the shape of the egg.

The Shell—The shell of the hen's egg consists essentially of calcium carbonate, the reported percentages varying from 93 to 98. This material is deposited in the uterus. The secretion of the shell by the uterus is probably brought about by a purely mechanical stimulus.

Curtis[13] has shown that the larger the egg, the greater is the mechanical stimulation upon the uterus and the heavier is the shell.

Passage of Egg Through Oviduct—The time consumed by the passage of the egg through the respective regions of the oviduct is as follows: The funnel and albumin-secreting portions, 3 hours; the isthmus, 1 hour or less; the uterus and vagina, 17 to 23 hours, 5 to 7 hours being consumed in the completion of the albumin and 12 to 16 hours for the completion of the shell and laying.

While the egg is in the uterus, it is possible to locate it by touch. It was found at the Utah Experiment Station that the whole flock could be handled early each morning and the individual hens which would lay that day determined with accuracy.

Shape—Amundson[12] concluded that the general shape of the egg is determined chiefly by the amount of albumin secreted in the albuminous part, the caliber of the lumen of the albuminous part and isthmus, and the muscular activity of the walls of these parts. The general shape thus determined may be more or less altered in the uterus, which with the isthmus gives each egg its particular form.

Size—In regard to the variability in size of hen's eggs Lippincott and Card[14] state:

> It is obvious that the weight of the egg is equal to the sum of the weights of its parts, and anything affecting the weight

of any of the parts may be expected to have some influence on the weight of the entire egg. The small size of the eggs laid by pullets at the beginning of the laying period is due in part to the smaller size of "yolk" in such eggs, as well as to the lesser amount of albumin. The shell is of course formed to fit the egg contents. That this small size is influenced by the age at which laying commences has been shown by several workers, but to what extent this relationship is due simply to the smaller size of the birds that begin to lay at earlier ages, is not so clear.

Physical Characteristics of the Albumin—The physical characteristics of the albumin are that of a translucent liquid without definite structure and, in the fresh egg, free from smell and taste. The albumin can be divided into four layers—a thin outer layer, a thicker layer next and a much denser layer following, with a thinner layer on the inside. The denser layer is prolonged in the form of two spirally coiled, opalescent cords which extend from the yolk toward the blunt and narrow ends of the egg, respectively. In appearance they resemble twisted cords. They are attached to the vitelline membrane of the yolk and are called chalazae.

Functions of the Albumin—The albumin has two distinct functions. The first is that of protection. The albumin forms a thick layer of material around the germ and, at the same time, furnishes the material in which it floats, thus protecting it from shocks which otherwise might prove fatal. In other words, it affords the protection to the chick embryo, which in mammals is provided by the maternal uterus. Its second function is to provide material which serves for the formation of tissue for the embryo.

Shell Membranes—The shell membranes consist of two layers—a thick outer layer next to the shell and a thin inner one next to the albumin. Both of these adhere closely to the shell, the outer layer being in direct contact with the shell, while the inner layer is adherent to the outer. At the blunt end of the egg, however, they are separated and form a small cavity or sac, known as the air cell. This is filled with air which has been drawn into the egg through the evaporation of the liquids. The size of the air cell increases with the age of the egg. If this air cell is found in any place but the large end of the egg, it usually indicates that the egg has been kept for some time and has not been turned. As a result, the liquids settle and force the air to the highest point.

The Shell—The shell is the outer envelope of the egg and its function is primarily that of protection. It is composed of three layers: (1) an inner or mammillary layer; (2) the intermediate or spongy layer; and (3) the surface cuticle. The mammillary layer consists of minute calcareous particles, about 0.01 to 0.015 mm. in diameter, adhered together with air spaces which communicate with the meshes of the spongy layer. The spongy layer is several times as thick and consists of matted calcareous strands. It is covered externally by the delicate shell cuticle. This is a porous structure and the pores communicate with the mesh work of the spongy layer. Thus, the entire shell is permeable to gases and permits of embryonic respiration, and the evaporation of water.

The main factor in propulsion of the ovum along the oviduct appears to be the peristaltic muscular contractions of the wall of the oviduct. The passage of the egg through the oviduct stimulates the glands of the mucous membrane of the oviduct to secrete the various layers of albumin, shell membranes and shell. It is probable that the cilia which line the cavity may have something to do with the rotation of the ovum on its chalazal axis.

Fertilization—The fertilization of the egg takes place in the anterior portion of the oviduct almost immediately after ovulation. The spermatozoa traverse the entire length of the oviduct after mating has occurred and are found in the uppermost portion in a fertile hen. Thus, fertilization takes place before the albumin has begun to be deposited around the yolk. Lillie[7] states that the ovum is surrounded immediately after ovulation by a fluid containing spermatozoa. The entrance of several spermatozoa into the germ spot seems to be characteristic of vertebrates with large

ova. However, only one of these spermatozoa unites with the germ spot. The other sperms that may have gained entrance migrate from the center toward the margin of the germ spot and disintegrate.

The length of life of the spermatozoa within the oviduct is considerable. There is definite experimental evidence of fertile eggs having been laid as long as 21 days after removal of the males from the pens. Reasonably good fertility may be expected to continue for at least a week or ten days after the removal of the males.

The Yolk—The yolk, or ovum, may be considered the most important part of the egg, since it contains within its outer wall, or vitelline membrane, the germ and also the nourishment for the growing embryo. The yolk is nearly round and light yellow, the degree or intensity of the color varying with the character of the food. The yolk is composed of two distinct portions arranged in concentric rings or layers. One is of a light color; the other is darker and more readily coagulable at high temperature. In the lighter portion of the yolk is a hollow or indentation, in the upper part of which (and next to the vitelline membrane) lies the germ, which can easily be distinguished by its whitish color and circular shape. Technically, it is referred to as the germinal disc prior to fertilization and as the blastoderm following fertilization, but before development has proceeded very far. It later gives rise to the embryo.

The development of the germ cell can be traced back to a point where the cell of which it is a part is yolkless, that is, when no yolk material has been added. The intimate structure of the germ cell is not well known. Before cell division has begun it consists, like all cells, of a mass of cytoplasm with a nucleus which contains a number of deeply staining granules, or chromatin. When the cell divides, these chromatin granules unite to form the chromosomes. It is thought that these chromosomes contain the genes which are to determine the characteristics of the individual.

The function of the yolk is to nourish the chick for the first few hours after hatching and during the early stages of its growth. It is just as essential to the young chick as the colostrum is to the calf. It supplies nutrients in easily digestible form and, at the same time, exerts a laxative influence which propels the digestive processes.

In the developing embryo and young chick the yolk becomes incorporated in the yolk sac. In the course of expansion of the blastoderm and extension of the extraembryonic body cavity over the surface of the yolk, it finally becomes enclosed in a separate sac. It remains connected by the yolk stalk with the intestine until, finally, sometime after hatching, it is absorbed completely. The yolk is absorbed by the entodermal lining of the yolk sac and is carried to the embryo in solution by means of the vitelline veins.

In composition the yolk is very rich in a phosphoprotein known as vitelline. Prosphoproteins resemble globulins but differ in that they yield phosphorus upon hydrolysis. The importance of phosphoproteins lies in the fact that they are the chief nutritive proteins for the growing young of birds and mammals.

General Aspects of the Hen's Reproductive System

The whole reproductive apparatus is a delicately adjusted mechanism. The primary function of the oviduct is to transmit the egg from the ovary to the exterior, but in the course of evolutionary development it has taken up several other functions, such as transmitting and storing sperms and the secreting of the accessory layers around the egg. The coördination between the infundibulum and ovary is very exact. It is said that the infundibulum actually embraces the ovum, in its follicle. This may be a factor in the cause of ovulation, although the internal pressure due to continued yolk formation is probably the most important factor in the normal rupture of the follicle. It is said that closing the funnel or removing the duct apparently does not greatly delay ovulation.

When the oviduct of a hen that is laying

daily is examined in advance of the deposition of the egg, it is found to be quite inactive. An examination shortly after laying, however, reveals the fact that the oviduct is in a high state of excitability, with the infundibulum usually clasping an ovum in the follicle. It seems, therefore, that the stimulus which sets off the mechanism for ovulation is not received until the time of laying, or shortly thereafter. As long as there is an egg in the lower part of the reproductive passage, the infundibulum apparently does not clasp the ovum and a second egg is thus prevented from entering the oviduct. This would explain why normally there is but a single egg found in the oviduct at any one time.

ABNORMAL EGGS

Soft-Shelled Eggs—There are some deranged physiological conditions which result in the laying of abnormal eggs. A condition about which the veterinarian is often consulted is the laying of soft-shelled eggs. Such eggs do not have a sufficient amount of shell substance covering the shell membrane. The immediate cause lies in a failure of the uterus or shell-gland-secreting portion of the oviduct to function properly. Soft-shelled eggs also may be caused by the peristaltic contractions becoming so violent as to hurry the passage of the egg without allowing time for the secretion and deposition of the shell. Soft-shelled eggs may be produced when the fowls are frightened or disturbed. Sometimes this abnormality is attributable to excessive feeding or a supply of material inadequate for the shell gland to produce the shell.

Yolkless Eggs—Small, yolkless eggs are familiar to every poultryman. These little eggs are designated under a variety of names, such as "wind eggs," "cock eggs," "witch eggs," "luck eggs," etc. They contain no definitely formed yolk and, to the casual observer, seem to consist of nothing but a small shell filled with white. The laying of such eggs is popularly supposed to mark the end of the laying period. This belief is without foundation. In fact, experimental evidence indicates that the bird must be in an active laying condition and that the more pronounced the degree of physiological activity of the oviduct, the more likely are such eggs liable to be produced. Further, there must be some foreign body, however minute, to serve as a stimulus which will start secretion by the albumin gland. It is also probable that ovulation must precede the secretion of albumin around the foreign body to form these eggs.

The Double-Yolked Egg—A very common abnormal egg is the double-yolked type, which results from a disturbance of the time relations of ovulation of such a nature that two yolks get into the oviduct at nearly the same time and become surrounded by common layers of albumin. When two yolks develop simultaneously and escape, being taken up by the oviduct at the same time, double-yolked eggs may develop. Double-yolked eggs also may be produced through the premature rupture of a follicle, which allows the yolk to escape into the abdominal cavity. This yolk may be taken up by the oviduct often just before or just after another yolk is received from the ovary, in which case the two yolks travel down the oviduct at the same time. Such yolks may be fertile and develop embryos, although they rarely hatch.

Foreign Substances—Occasionally, foreign substances are found in the eggs. These foreign substances may be blood streaks or spots, blood clots, worms, fecal matter, etc. The blood which makes the blood spot usually comes from the ovarian follicle. The so-called "liver" or "meat" spots found in eggs are in nearly every case thoroughly hardened blood clots. These inclusions do not represent portions of the oviduct, as is commonly thought.

Parasites—Parasites found in eggs have evidently migrated from the cloaca into the oviduct for a sufficient distance to meet a developing egg and settle in the coverings of the yolk. Similarly, the presence in eggs of fecal material, fragments of feathers, bits of plants, and even pebbles probably results from the passage of the material up the oviduct from the cloaca

and its incorporation in the egg during the passage through the oviduct.

It sometimes happens that what appears to be a double-yolked egg is found to contain another egg instead. For some reason, the egg normally formed and ready for laying is forced back up the oviduct, by reversed peristalsis, into the albumin-secreting portion, which causes a new secretion of albumin and, when it passes down the oviduct again, it receives the second deposition of shell membranes and shell.

INCUBATION

The period of incubation for eggs of different birds is given in the following tabulation:

Hen	21 days
Pheasant	25 days
Duck	28 days
Peafowl	28 days
Guinea fowl	25 days
Goose	30 days
Turkey	28 days
Pigeon	18 days
Swan	42 days

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Animated Scarecrow

The agricultural experiment station at East Lansing, Mich., we were told the other day, has a scarecrow that holds a gun operated by carbide gas which explodes every few minutes or so. Birds that laughed at the old cross and coat keep clear of this one.

"Dead as a Dodo"

"Dead as a dodo" is a phrase based not upon a mythical creature but upon a bird that really existed in the Mascarene Islands until the 17th century. The dodo, incomplete skeletons of which are seen in European museums, had short legs and practically no wings. Being unable to protect itself, it was quickly exterminated where man came upon the scene. The dodo is comparable to the nation ill-prepared for war.

Slitting the Crow's Tongue

Many persons are of the opinion that slitting the tongue of a crow will enable it to talk. This is a fallacious belief, doubtlessly based upon the fact that crows are great mimics and can sometimes be taught to talk almost as well as parrots. However, their ability to talk is not influenced the least by slitting the tongue. It is a barbarous practice and should be discouraged. —*You're Wrong About That.*

Pathogenic bacteriology that does not include physiology, the study of the living media in which bacteria grow, is an incomplete science.

Reproduction can not occur in the absence of vitamin E, and vitamin A deficiency is likewise known to cause complete sterility.—*From Veterinary Medicine.*

Erysipelothrix Rhusiopathiae Associated with a Fatal Disease in Ducks

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THE OCCURRENCE of swine erysipelas in fowls (turkeys) was first recognized by Jarosch.[1] Similar bacteriological findings have been reported in turkeys, chickens, ducks, and pigeons as well as in birds in zoölogical gardens. Hausser[2] isolated an organism similar to the causative agent of swine erysipelas from three chickens, while Schipp[3] described in chickens cases of septicemia associated with a Gram-positive rod indistinguishable morphologically, culturally, serologically, and tinctorially from the swine erysipelas bacillus.

Broll[4] confirmed Schipp's bacteriological findings in a flock of chickens, all of which died within the course of several weeks. The strain isolated from one fowl was found to be highly virulent for pigeons, chickens, white mice, and rabbits. Poels[5] compared erysipelas strains isolated from ducks and pigeons with those isolated from swine and cattle and came to the conclusion that all strains may cause swine erysipelas with the help of predisposing causes. Jarmai[6] found the swine-erysipelas microörganisms in birds in a Budapest zoölogical garden. Eber[7] isolated Erysipelothrix from ducks and from a turkey hen. Pfaff[8] observed an outbreak of disease associated with the swine-erysipelas bacillus in fowls of from one to three weeks of age. Fowls of two to three months of age or older, on the same farm, seemed to be resistant.

Scholl and Jacquart,[9] after an investigation of swine-erysipelas epidemics of chickens and ducks, came to the following conclusions: (1) Many times the erysipelas bacillus gave rise to a fatal septicemia among fowls; (2) serum inoculation was beneficial in combating the disease; and (3) the infection in fowls, similar to that in swine, depends upon certain predisposing factors which were very difficult to determine. The ducks described in that report had access to offal from a slaughterhouse. Cominotte[10] was successful in immunizing pigeons and swine by means of peptone-less broth cultures of erysipelas which had been stored in the incubator for six months. Marinelli[11] reported that polished rice lowered the resistance of pigeons to cholera and erysipelas. Meyer[12] was unsuccessful in separating the swine and fowl erysipelas microörganisms by means of morphological, cultural, or biochemical procedures. Schmidt-Hoensdorf[13] reported epidemics in birds in a zoölogical garden and in a flock of domestic fowls. A direct connection between the causes of these epidemics and the cause of swine erysipelas was demonstrated.

Fig. 1. Commercial duck farm in northern Illinois where acute disease of ducks occurred. Over 46,000 ducks were hatched and marketed from this farm in 1931. The septicemic-like disease was first observed in December, 1931, and appeared in ducklings of 10 weeks of age. As many as 40 died hourly while the infection was at its peak.

More recently, swine erysipelas infection in turkeys in the United States has been reported by Beaudette and Hudson[14]; Madsen[15]; Van Roekel, Bullis, and Clarke[16]; Hoffman and Hinshaw[17]; and Rosenwald and Dickinson.[18] These reports have redi-

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rected our attention to an organism isolated from ducklings in Illinois in 1932.

DUCK ERYSIPELAS ON ILLINOIS FARM

On the duck farm where *Erysipelothrix rhusiopathiae* was encountered (fig. 1) hatching was instituted in January and continued throughout the year. During the first eleven months of 1931, approximately 46,000 ducklings were hatched and fattened on the premises. In December of the same year a septicemic-like disease appeared in ducks 10 weeks of age. It was estimated by the owner that during a period of four

Fig. 2. Brooding and feeding house where heaviest losses occurred. High ceilings and large pens with wire partitions favored cross currents and made it impossible to prevent drafts and sudden temperature changes. Many of the surviving ducklings reared in this house were unthrifty.

months, between 10,000 and 12,000 ducks succumbed to this disease. On some days as many as 30 to 40 died in one hour. Many of the surviving fowls in the fattening pens were unthrifty, and chronic arthritis was noted in several of the surviving ducks in pens where losses occurred.

The principal losses occurred in birds housed in a newly constructed, double-deck brooding and feeding house that accommodated approximately 7,000 ducklings (fig. 2). This house has a high ceiling and large runway pens with wire partitions. Cross drafts and temperature fluctuations could not be prevented in the housing quarters. The air currents noted in these quarters suggested that chilling of the ducks might be a factor, since the heaviest losses occurred in the new house. Since all ducklings were hatched from eggs from the same breeding stock and fed the same rations, the disease appeared to be associated rather definitely with environmental factors in the newly constructed house. The health and vigor of the breeding stock appeared to be normal, as judged by general appearance, egg production, and hatchability of eggs. Egg production was 85.5 per cent, fertility 90.7 per cent, and hatchability 70.3 per cent.

Inquiry into the history of the malady, including a survey of the premises, indicated that the ducks had had no contact with hogs or other animals infested with *E. rhusiopathiae*. No pork by-products or fish products were being fed to the ducks. Small isolated portions of mash in the feed bins proved to be visibly moldy, yet the distribution of losses failed to incriminate the rations.

BACTERIOLOGICAL FINDINGS

The first duck specimen from which Erysipelothrix was isolated was received in good condition at the laboratory on March 24, 1932 (specimen 22353). Autopsy and cultures were made in a routine way without knowledge of the losses occurring on the farm or the clinical nature of the disease. The first indication of the disease, according to the owner, was for hitherto apparently healthy ducklings to drag themselves along a short distance and topple over dead.

The following notations were recorded on the first duck specimens received for examination.

Specimen 22353: Duck, approximately one month of age; dead but in good condition; probably died enroute to laboratory. Heart muscle firm; numerous petechial hemorrhages (subepicardial); lungs congested; liver dark and slightly congested; spleen enlarged; duodenum greatly congested.

The heart blood of duck 22353 yielded a slender, Gram-positive, non-spore-forming rod, which was agglutinated by known positive *E. rhusiopathiae* serum in dilutions as high as 1:640.

Dextrose, lactose, maltose, and saccharose were not fermented. Transfers grew on plain agar slants. There was no hemolysis

TABLE I—Pathogenicity of E. rhusiopathiae for healthy ducks.

Physiological Suspension of Agar Cultures*	Age of Healthy Ducks Treated	Strains of E. Rhusiopathiae Isolated From Ducks									
		22353-HB		24099-B-Spl		23661-A-Spl		24100-A-HB		22353-HB-Erysipelothrix + 24102	
		Ducks Treated	Results	Ducks Treated	Results	Ducks Treated	Results	Ducks Treated	Results	Ducks Treated	Results
0.5 cc. subc.	3½ wks.	1	Released	1	Released	1	Released	1	Released		
	1 wk.									1	Died
1.0 cc. subc.	1 wk.									1	Released
	Adult			1	Released						
2.0 cc. subc.	1 wk.									1	Released
2.5 cc. subc.	Adult	1	Released								
3.0 cc. subc.	1 wk.							1	Died†		
	2½ wks.	1	Died†							1	Released
4.0 cc. subc.	1 wk.							1	Died†		
	4½ wks.	1	Released			1	Died†				
5.0 cc. subc.	2½ wks.					1	Released				
	4½ wks.										
	½ grown	2	Died†								
8.0 cc. subc.	4½ wks.									1	Released
0.5 cc. fed.	1 wk.							1	Died†	1	Released
1.0 cc. fed.	1-1½ wks.	1	Died	1	Released	1	Released			4	Released
2.0 cc. fed.	1 wk.										
7.5 cc. fed.	2½ wks.			1	Released						

*Suspension of turbidity of McFarland No. 1.
Released ducks appeared healthy. The time of release was 16 days to two months after treatment.
†*E. rhusiopathiae* recovered in cultures.

on blood-agar plates, and neither blood nor serum agar accentuated growth.

GROSS PATHOLOGICAL LESIONS

During a period of three months, approximately 140 ducks of various ages were shipped from the farm to the laboratory of animal pathology and hygiene, University of Illinois, for examination. Many arrived dead, but from 35 specimens which showed little evidence of postmortem changes at autopsy, a single culture on plain agar was made from heart blood, liver or spleen. Uncontaminated plates showing isolated colonies were selected for study.

E. rhusiopathiae strains were isolated in pure culture from six ducks, while streptococci were isolated from 32 other duck specimens, and Pasteurella-like strains from two. Gross pathological lesions suggestive of septicemia were encountered. These lesions consisted of serofibrinous exudates in the air sac and areas of congestion in the small intestine. The liver was frequently enlarged, friable and mottled, and occasionally showed numerous yellow pin-point foci. The spleen was usually dark, enlarged, and soft; the lungs were congested; and the heart often showed petechial hemorrhages. One group of half-grown ducks showed dark, congested areas in the webs of the feet, and the femorotibial articulations of some of the ducks appeared chronically enlarged.

PATHOGENICITY OF MICROÖRGANISMS ISOLATED FROM DUCKS

E. rhusiopathiae: The pathogenicity of the Erysipelothrix isolated from ducks was determined both by feeding physiological saline suspensions of agar cultures to ducks and by injecting similar suspensions subcutaneously into guinea pigs, rabbits, mice, chickens, pigeons and ducks. Twenty-nine ducks, ranging in age from 1 week to adult, were injected subcutaneously with from 0.5 cc. to 5 cc. of a physiological saline suspension of agar cultures (table 1). Eight of these ducks died within five days after inoculation, and Erysipelothrix was recovered from the heart blood and spleen of each. All ducks which died following inoculation were young (one week old to half-grown), while mature ducks similarly exposed appeared resistant. Physiological salt suspensions of agar cultures of the *E. rhusiopathiae* isolated from ducks were fed in 0.5-cc. to 7.5-cc. amounts to twelve 1- and 2½-week-old ducks (table 1). Three of the ducks died within 19 days. Erysipelothrix was recovered from one 10-day-old bird of this group, which died 19 days after being fed 1 cc. of *E. rhusiopathiae*.

Six chickens and eight pigeons were inoculated subcutaneously with 0.5-cc. to 1.5-cc. amounts of a physiological salt suspension of an agar culture of Erysipelothrix isolated from ducks (table 2). The microörganism was recovered from one chicken and three pigeons which died four to twelve days after inoculation. Seven mice were inoculated subcutaneously with 0.1 cc. of a physiological salt suspension of *E. rhusiopathiae* agar culture isolated from ducks that had died within five days. The microörganism was consistently recovered in culture from inoculated mice at autopsy. Rabbits and guinea pigs proved refractory to subcutaneous inoculation of *E. rhusiopathiae* strains isolated from ducks (table 2).

Streptococcus: Sixteen healthy ducks, one-quarter to full-grown, were inoculated subcutaneously with cultures of streptococci isolated from ducks. Six were inoculated with 1 cc. of a suspension of agar cultures of a gamma streptococcus and the other ten were inoculated with 3 cc. of a composite made from cultures of alpha streptococci. At the end of 17 days, all 16 ducks were released healthy.

EXPERIMENTAL IMMUNIZATION OF DUCKS

Swine-Erysipelas-Immune Serum: An effort was made to prevent losses on the duck farm by experimental inoculation with erysipelas-immune serum and bacterin.* Three hundred and forty-three ducks (4 to

*Dr. G. W. Jensen, Antioch, Ill., kindly coöperated by injecting the fowls with immune serum and bacterin prepared at the laboratory of animal pathology and hygiene. Bacterin was prepared by growing strain 22353, isolated from a duck, on agar for 96 hours and by killing with 0.5 per cent phenolized saline. The antiserum was prepared by repeated inoculation of a horse with an Erysipelothrix strain isolated from sheep by Dr. Hadley Marsh, Bozeman, Mont. The antiserum had an agglutination titre of 1:1280.

TABLE II—Pathogenicity of E. rhusiopathiae for mice, pigeons, chickens, guinea pigs and rabbits.

Animals Treated	Physiological Suspension of Agar Cultures*	Strains of E. Rhusiopathiae Isolated From Ducks									
		22353-HB		24099-B-Spl		23661-A-Spl		24100-A-HB		22353-HB + 24102	
		Animals Treated	Results	Animals Treated	Results	Animals Treated	Results	Animals Treated	Results	Animals Treated	Results
Mice	0.1 cc. subc.	2	Died†	1	Died†	1	Died†	1	Died†	1	Died†
Pigeons	0.75 cc. subc.	1	Released					1	Died†		
	1.0 cc. subc.	1	Died	1	Died†	2	Died Released				
	1.5 cc. subc.	1	Died†								
Chickens (2 wks.)	0.5 cc. subc.	5	Died‡								
	1.0 cc. subc.	1	Released								
Guinea pigs	1.0 cc. subc.			1	Died	1	Died				
	2.5 cc. subc.	1	Died								
Rabbits	2.0 cc. subc.	1	Released	1	Released	1	Died				

*Suspension of turbidity of McFarland No. 1.
†*E. rhusiopathiae* recovered in cultures.
‡*E. rhusiopathiae* isolated from one chicken; chickens died of laryngotracheitis. Guinea pigs died of paratyphoid.
Released animals appeared healthy. Time of release was 16 days to one month after treatment.

6 weeks old) were injected with 2.5 to 3.5 cc. of erysipelas-immune serum. Ninety-eight (28.6 per cent) died within 10 days after injection. One hundred and fifty-two (31.2 per cent) of 488 controls died within ten days. Another group of 95 ducks (4 weeks old) were injected with 4 cc. of serum per bird. Thirty-eight (40 per cent) of these ducks died within 15 days after injection, while 40 (42.5 per cent) of the 94 controls died within the same length of time. One hundred and one ducks (4 weeks old) were treated with 6 cc. of serum; 50 (49.5 per cent) of them died within 29 days, and 46 (47.0 per cent) of the 96 controls died. No effort was made to culture treated or untreated ducks that died, for the reason that difficulty was experienced in shipping ducks to the laboratory in condition for bacteriological study.

Swine-Erysipelas Bacterin: One hundred and seventy-six 3-week-old ducks were each injected with 1.5 to 2 cc. of *E. rhusiopathiae* bacterin. Thirty-two (18.2 per cent) of these died within ten days after injection, while 59 (26.3 per cent) of the 224 controls died within the same length of time. A group of 122 5-week-old ducks were injected with 5 to 6 cc. of bacterin. Thirty-two (26.2 per cent) of these died within twelve days after injection, while 52 (50.5 per cent) of the 103 controls died within the same length of time. Erysipelothrix was not isolated from any of the treated ducks or controls that died.

SUMMARY

On a farm in Illinois approximately 10,000 ducklings succumbed to an acute septicemic disease. *Erysipelothrix rhusiopathiae*, or a culturally and serologically indistinguishable microörganism, was isolated from some of the ducks after death.

The strains of *E. rhusiopathiae* isolated from ducks were pathogenic for pigeons, mice, and ducks. Rabbits and guinea pigs proved resistant to the subcutaneous injection of suspensions of agar cultures. Several healthy, mature birds inoculated with strains of the microörganism isolated from spontaneously affected ducks remained healthy, suggesting the possible significance of age as a factor in resistance. The influence of environmental factors was suggested by the high mortality in one house in which the birds were subject to drafts and temperature fluctuations.

Attempts to protect ducklings (with erysipelas serum and bacterins) on contaminated premises and environmental conditions under which the spontaneous disease developed were not successful.

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Some idea of the minute size (of viruses) may be gathered from the fact that 1,000,000,000,000 particles of the virus of foot-and-mouth disease would occupy less space than the head of a pin.—*Canadian Journal of Comparative Medicine.*

EDITORIAL

A Message to Contributors

IN WRITING for publication "modern usage" is a mighty phrase. It classifies the author, the editor and the vocation, and engraves their work on the echelon of the public eye. In the manner of speaking, customary usage in printing material is the truest yardstick of the critic. In the medical profession, where contributions to the literature once came from busy physicians who were more concerned in the doctrines of medicine than those of journalism, the need of setting down definite standards for the edification of medical authors has long since been recognized. The need was outwardly expressed in such books as "Suggestions to Medical Authors," "The Art and Practice of Medical Writing," and "Medical Writing," published by the American Medical Association for the obvious purpose of improving the periodical literature of the medical profession.

Medical literature was enriched last year with the latter addition to the "Fishbein Series." The authors are Morris Fishbein, editor of the *Journal of the American Medical Association* and his assistant, Jewel F. Whalen. The book is dedicated to the former editor of that journal, Dr. George F. Simmons, "in recognition of his contributions to the advancement of scientific medical literature." In effect, these books scold the doctors for their careless use of the English language, for rambling verbosity, for the use of disapproved slang and wisecracks, and for all-around, carefree abuses, which make a lot of work for the editors in their oftentime hopeless task of transforming a manuscript into acceptable reading material.

Those who write medical articles for publication will find explained in these books all of the troubles of editorial work and publication, their prevention and treatment, and the usual reasons for revising, abridging and rejecting manuscripts submitted for attention.

Since our own journal is undergoing a revamping process under the direction of a reorganizing committee, these books are lifted from the shelf and reread to confirm the contentions we are striving to impress upon our own family of writers. As told incidentally in previous issues, these contentions appertain to (1) the number and length of articles, (2) the order of publication, (3) the conservation of space, (4) the diversification of subjects, in order to cover as many branches of the service as possible in each issue, and (5) deleting technical and literary infelicities within the ken of the editor and his associates.

The above presents have grown out of nearly three years of painstaking study of the alleged unpopularity of the JOURNAL by the Reorganizing Committee. Obedience to them, in the spirit of coöperation, is invited. This done, the membership may expect the JOURNAL to become a welcome monthly visitor and, let us hope, a periodical essential to the advancement of veterinary medicine.

LENGTH OF MANUSCRIPTS

As pointed out in magnificent sarcasm by Fishbein, "an article of 500 words may be too long and one of 5,000 too short." Parenthetically speaking, the material must justify the printed space it occupies. Editors well know that in the combing of manuscripts, much has to be stricken out, and this can be accomplished without sacrificing clarity, emphasis, coherence or educational value. In our case, except where mistakes are glaring or abridgement is a mechanical necessity, the JOURNAL, fearing to offend, has been too timid to take these liberties with manuscripts. Whether this timidity has been due to an inferiority complex in the editorial room or just ill-advised

politeness is not insisted upon, but the fact remains that space *is* a problem of the J.A.V.M.A. requiring the coöperation of the contributors. Writing letters to angry authors, day after day, explaining why a manuscript submitted two (and sometimes more) years ago is still in the waiting file must somehow be overcome. The usefulness of the Association and its popularity are at stake. Common understanding on this important question is as much in order as complaining without understanding is out of order. The facts must be faced and intelligently handled.

Paraphrasing a previous hint in this regard, the too free use of long tables and charts is somewhat objectionable when the facts portrayed might be set down in a few short sentences. The risk of being criticized for this suggestion is not discounted. Authors are apt to be touchy about the striking out of tables representing a lot of hard, painstaking work. A practical solution would be to set up the tables and insert them in the reprints, charging the bare cost of composition to the author. If the existence of such tables were indicated by an interpolation of the fact, the reprint would be thus authenticated.

Acceptable Standards for Manuscripts

In this regard the JOURNAL is well protected. It has a group of specialists—the associate editors—who will judge what is and what is not apropos in both the art and science of their branch of medicine. Readers may, therefore, be assured that fantastic fiction, unsupported by scientific knowledge, will be rejected. As Fishbein has pointed out, "The reader depends on the editor not to publish fiction for fact or fallacies which he (the reader) is not qualified to detect."

The desirable paper is the one containing new facts established by original research or observation. Papers embracing original methods or principles belong in this category, whether they evolve from the classical work of the laboratory or the prosaic labor of the clinic. A plethora of material on a given subject is as objectionable as it is hard to avoid. Equine encephalomyelitis and sulfanilamide are examples of the moment in this respect.

Clinical Data

Case reports are always acceptable, provided they accurately recount the sequence of events which led to the author's conclusions. The case report is the basis of good medical literature. It deals with the objective of all medical studies, and is, therefore, as competent for the research man who makes discoveries as the practitioner who uses them. Illustrations verifying the text improve the value of case reports.

While revealing details are advisable, prolixity *per se* is objectionable, unnecessary.

The News

In a large country like ours, where veterinarians labor under so many different conditions, news on the incidence of diseases, the activities of societies, disease-control projects, and personal matters are urgently solicited. The JOURNAL aims to lay down a true picture of what is transpiring in the veterinary service from coast to coast and beyond international boundaries, believing that important lessons are taught by such news. A glance through the revamped issues will reveal our intention to keep these pages filled with useful material. The educational value of this feature will depend upon the thoughtfulness of the membership.

Choosing a Doctor

IN A MEMORANDUM suggesting the way to choose a family physician to the best advantage, the United States Public Health Service sets down the information in the form of five questions, *to wit:*

1. Is he a graduate of a Class A school of medicine (as defined by the American Medical Association), or a medical school known by recognized authorities as one of the best at the time he was graduated?

2. Is he a licensed practitioner in the state where he has his office?

3. Has he had actual training as an intern in a hospital or been associated with

a practicing physician long enough to have obtained practical education in medicine?

4. Is he an active member of his local, county, and state medical societies, and through them of the American Medical Association, or any other recognized body of physicians?

5. Is he of good personal habits, regarded by his fellow citizens as a desirable member of the community?

If he is the physician of fellow practitioners, that is an excellent guarantee of his ability. . . Avoid a booster; a good doctor does not brag of his cures or suggest that they are made by secret remedies.

Hardly a day passes but some letter is received asking about the choosing of a veterinarian for a particular purpose, or an assistant, or for permanent location in a community. With minor exceptions, the suggestions above have been the guiding factors in making the replies, for in regard to qualifications and ethics, medicine is medicine whether it concerns man or animals.

Screwworms

THE SCREWWORM, maggot of the Texas screwworm fly, *Cochliomyria americana* (Cushing and Patton, 1936), is the most important member of the families Sarcophagidae and Muscidae (order Diptera) in the practice of veterinary medicine. Under the name of *C. marcellaria*, Herms gives its distribution "from Patagonia to Canada."

The department of animal pathology, University of Illinois, regards the screwworm as a pathogen of considerable importance in the state of Illinois. Vanlaw, a onetime famous oöphorectomist, who spayed heifers on a large scale all the way from the Panhandle to the Black Hills every summer, mentioned the presence of this blowfly[1] at the most northern end of his annual travels with the roundups, and spoke of the unfortunate mortality that sometimes followed his surgical work, as a consequence thereof.

Herms[2] describes a fatal case in a man in Kansas who was inoculated in the nostril while asleep. The larvae invaded the recesses of the nasal cavities and Eustachian tubes and burrowed through the palate into the mouth. Death occurred from abscesses, despite the attempts made to dislodge the larvae, after he had suffered for two months.

Pinto[3] mentions a gruesome cutaneous case (fig. 1) of Sarcophagidae myiasis in

—*Photo, Instituto Oswaldo Cruz.*

Fig. 1. Facial screwworm infestation; a fatal case.

Brazil that ended fatally, and another affecting the oral cavity which yielded to treatment. It is, however, in animals abandoned to the vicissitudes of outdoor life and unaided that screwworm flies inflict the greatest amount of damage. Although more common in cattle, none of the pastoral animals is exempt from deposits of screwworm larvae in accidental or surgical wounds. Prevention is better than cure. For the latter, everyone has his favorite remedy.

References

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A person not vaccinated against smallpox is a menace to mankind—a medium for the propagation of the most dreaded of human ailments, variola major.

Wheat Germ in the Bread We Eat

SPEAKING of germless white flour before the American Chemical Society, Dr. Robert Runnels Williams, winner of the Society's highest award last year, said, "Man commits a crime against nature when he eats the starch from seeds and throws away the mechanism necessary for the metabolism of that starch."

When the steel roller began to replace the old millstone back in the 1870's, it was heralded as a great improvement in the milling of wheat flour. The new process removed the germ from the rest of the grain and thus prevented the flour from becoming rancid. As rancidity of flour was the nemesis of the old millers, this method of preventing the spoilage was a welcome invention. Everybody was satisfied. The flour would "keep" in the barrel and sack, the yeast literally flamed through the dough, and the bread was beautifully white and fluffy. Milling of wheat had reached a new high on the way to the goal of culinary perfection.

It was, however, not suspected that the germ element removed carried away ingredients necessary for the utilization of the starch and protein contained in the finished product—vitamins B_1, B_2 and E, which science was to catalogue later among the essentials of normal nutrition. In fact, the staff of life, a phrase coined for bread long before steel-roller milling came upon the scene, became a misnomer.

The strife between the proponents of the old and the new milling process may, however, have a happy ending. A method of manufacturing flour containing wheat germ has been perfected. That the invention is not a fantastic dream was proved very recently, when Dan Hedges Brown (U. of C. '16) former football player on the Maroons, presented to his alma mater, the University of Chicago, 20 per cent of the royalties derived from a milling process by which the flour retains the germ of the grain and yet does not spoil in storage. The gift, the press reports say, will eventually amount to over $1,000,000 annually. Thus, a fault of steel-roller milling, developed to overcome spoilage, which probably cost millions of lives by removing important ingredients from bread during the past 70 years, appears to have been corrected. Perhaps bread may again become "the staff of life."

In the feeding of animals, wheat has never occupied a place comparable to that of the other small grains, notwithstanding its high nutritive values. The cause of this discrepancy appears to be an open field for research. Delicate changes in the ingredients of the germ may be the determining factor. Certainly, if the wheat germ contained in flour becomes rancid and inert, the by-products of milling, which go to the feed lots, must undergo similar processes of deterioration.

The Use of Degrees With Names of Authors

THE PRESENT staff of the JOURNAL has adopted the plan of identifying contributors of articles by their college degree or degrees in order to distinguish veterinarians from other authors who furnish material for publication. The object of this ruling is to build up an understanding of what the D.V.M. degree represents—an omission that has been too long delayed in our literature. The harm done is incalculable. It has prevented veterinary medicine from being known as a branch of science and it has left the impression among editors of scientific publications that veterinary authors prefer to hide their identity behind other titles and degrees. The credit for excellent contributions to the field of medicine and allied sciences seldom goes to the veterinary profession in medical and secular literature because we have not proudly appended D.V.M. to our names and insisted that it be used. Veterinary medicine must somehow be identified as a branch of science and there is no better place to begin to have that desideratum brought about than in our own literature.

Veterinary Science in General Education

A BOOKLET of 133 pages, published by the Illinois department of agriculture for the use of teachers of vocational agriculture in the high schools of that state, exemplifies the trend in preparatory education of boys—a trend that is gradually focusing attention to the importance of veterinary science in a general education and one that fixes, in the popular mind, the dominant rôle domestic animals play in human welfare. The booklet was edited by Robert Graham, director of the department of animal pathology and hygiene of the state university and Jesse Sampson, associate professor in that department.

But what catches the eye is the significance of the foreword written by Chief Veterinarian H. C. Rinehart, who says in part:

> The live stock industry of Illinois is valued at approximately five billion dollars. Sixty-five per cent of the income of the farms is derived from live stock . . . in fact, about 70 per cent of the grain raised in the United States is fed to animals. To protect this industry against losses from preventable diseases, veterinarians and live stock owners have developed a system of live stock management. . . . Prompt isolation, frequent disinfection and feeding of balanced rations are the home-made measures for protecting against diseases. However, when disease appears, the value of prompt diagnosis can not be overestimated and when sanitary measures fail and diseases develop, a competent veterinarian should be employed without delay . . . Sanitary measures and good management are the responsibility of the stockman . . . the veterinary profession encourages these measures and hopes the lessons in this booklet will prove valuable.

Nowhere in the veterinary educational system have there been made more favorable changes than in the high schools and agricultural colleges. What was once misconstrued as a threat to the development of a formal veterinary profession has now become an aid to its progress. The public is being made more definitely conscious of the importance of veterinary medicine through these agencies than through the best managed publicity campaigns the profession could carry out. The rating of veterinary science in general education is being fixed at the right place—in the minds of the young—and upon a nation-wide scale by capable teachers in the high schools and agricultural colleges who are now too fully aware of the vast scope and tremendous importance of the science they teach to waste time on the prosaic details of the art at the expense of governing principles which are found quite sufficient to fill up the curriculum. The conflict between agricultural and veterinary education is being filed in the archives of the past and is being replaced by mutual understanding. The importance of domestic animals in the march of man, pressing itself upon the public mind, is the underlying cause of the transformation—the reformation. In short, the care of animals is no longer a fringe of the educational system; it is solidly welded into it because of a better understanding of the fact that without a properly managed domestic animal industry, mankind would have a rough and rugged road to travel, downhill.

Going back to the booklet, it is refreshing to note that the fundamentals of physiology are set down as the basis for the care of animals in health and disease, that the importance of sanitation, ventilation, feeding and general care are emphasized, and that medication is left to the competent veterinarian who, throughout the text, is the main figure in the handling of disease. A fine line of demarcation is drawn between nurse and doctor in such a way as to leave no doubt concerning the part each is to play in the future husbandry of animals. Choosing at random a few recommended treatments, one finds for Bang's disease:

> A competent graduate veterinarian should be employed to collect blood samples for the agglutination test and to treat any serious illness in the herd. Quack or "cure-all" remedies, including proprietary mineral mixtures advertised as abortion cures, should be avoided.

For actinomycosis one reads:

> Lumpy jaw is one of the few diseases treated by a specific drug. Iodine exerts a remarkable effect on the lesions and under proper, vigorous medication, 90 per cent of the early cases that do not involve the bone and 10 per cent in which the bone is affected can be cured . . . the dose to use

is to be judged by the veterinarian.

For milk fever:

> Milk fever should not be a source of loss, if owners watch their animal closely, avoid attempting to force medicines into cows affected with this disease and call the veterinarian promptly.

While other examples might be cited from the text, these indicate the thoughts expressed by the authors throughout. But what is more revealing is the difference between the veterinary booklets of this hour and those, published during the formative period of the veterinary profession, which encroached upon the field we were attempting to cultivate, and tended to test the patience of the professional man. The passing of that day is seen in the development of "Veterinary Science in General Education," at one time a nemesis of our art and, now, our best advertising medium.

Musca Domestica

The common house fly seldom wins much attention because it is one of those nuisances most of us accept casually and without great interest in its gruesome nature. The offspring of a single pair of house flies could amount to 335 trillion in a single summer, provided, of course, that all of the ova found favorable media for hatching and growth.

That *Musca domestica* is a gruesome creature is saying too little about its filthy habits. Besides having a partiality for things disgusting, its body is a hairy catch-all for dirt; its feet are sticky, germ-laden pads; and the pair of soft, fleshy lobes of its proboscis puke offensive droplets on everything it tries to eat. Flyspecks tell the story of its many latrines, and authorities on contagious diseases list over 30 specific infections transmitted by this buzzing insect of the household—an insect that would not exist at all but for the nice breeding places we furnish it. The life cycle of *M. domestica* is well known, but—well, what's the use; science is always a generation ahead of its human application.

A Grave Infection

A GRAVE infection is spreading through the veterinary profession. Its name is "Display Advertising" and it is found in telephone directories, newspapers, and circulars galore. Unless prompt action is made to check its remarkable patency, the whole profession may as well admit that it is sinking to a low level from which there is no return passage, at least not for many, many years to come.

Everywhere, telephone directories are glutted with disgraceful violations of the weakest code the mind could conceive for professional men. As this issue is going to the printer, comes a daily newspaper carrying a 10″ x 6″ display advertisement of a 1938 graduate, announcing:

> Dr. ———————, Veterinary Hospital,
> Small and Large Animals at Reasonable Prices.
> Calls Answered Immediately
> Dogs Clipped and Bathed
> Medicine for Those Panting Horses
> Dr. ———————
> Night phone ——— Day phone ———, N. C.

The sender of this newspaper wants to know if the A.V.M.A. would approve such an advertisement. The answer is that any kind of advertising is disapproved, but to this must be added the confession that in recent years no action has been taken to press obedience to the Association's fundamental laws in this respect. The situation, however, has become so ridiculous that the Association, without further delay, is obligated to take action against an evil trend which is reducing it to a society of advertising doctors. Steps must be taken immediately to forestall a mandamus from the ethical members. Better that we have a smaller society of ethical members than a large one mixed with advertisers.

The writing of this editorial was prompted by the deluge of correspondence aimed to curb the development of this "grave infection."

The prehistoric elephant, called the mammouth, was not a large animal. Its average height was about ten feet. It was named from *mammot*, meaning a burrower. Comparing it to the extinct animals, like the dinosaur, is erroneous.

APPLICATIONS

The A. V. M. A. is very definitely climbing to a new height of popularity and power. To insure this upward trend, the Reorganizing Committee of the Executive Board has formed a network of important projects. Some of these are already under way; others will be inaugurated after approval of the membership at the Memphis meeting. Because each of these plans is solidly founded—based upon a careful analysis of what organized veterinary medicine needs—the Committee's program will inevitably bring greater benefits to every member.

First Listing*

BAILEY, O. LEIGHTON

10 S. Pine St., Spokane, Wash.
B. S., D. V. M., State College of Washington, 1932. Vouchers: Marvin R. Hales and Robert R. Weller.

BAKER, HARRISON V.

161 Main St., Hamburg, N. Y.
D. V. M., Cornell University, 1914. Vouchers: Cassius Way and C. P. Zepp.

BAKER, HOWARD L., JR.

Centre Square, Pa.
V. M. D., University of Pennsylvania, 1939. Vouchers: M. A. Emmerson and John D. Beck.

BEERS, ALFRED M.

49 South, Warwick, N. Y.
D. V. M., Cornell University, 1931. Vouchers: C. P. Zepp and Cassius Way.

BROADWELL, JOHN M.

R. F. D., Box 162A, La Porte, Texas.
D. V. M., Colorado State College, 1936. Vouchers: H. R. Willard and W. A. Lawrence.

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The amount which should accompany an application filed this month is $7.08, which covers membership fee and dues to January 1, 1940, including subscription to the JOURNAL.

Correction: The number of the July, 1939, issue of the JOURNAL appeared on the cover and backbone as "No. 448." This should have read, "No. 748."

CLINICAL DATA

Three Cases of Cerebellar Agenesia

By L. B. SHOLL, B.S., D.V.M., E. K. SALES, D.V.M., and R. LANGHAM

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Case 1—Agenesia of Cerebellum in a Dog

The subject was a wire-haired Fox Terrier, male, 4 months old. It was one of a litter of five born on May 23, 1938. Three weeks after birth, two of the puppies were observed in a standing position with the head pressed against the wall of the box. They were unable to stand and went from place to place by rolling. There was a heavy ascarid infection which, according to the owner, improved after treatment. They were treated again at 7 weeks of age. One of these puppies was killed by an automobile but was not examined. The other was submitted for autopsy.

Autopsy Findings—No definite gross lesions were noted in any of the internal organs except the brain. The cerebrum appeared much smoother than normal and somewhat lacking in convolutions. There was complete absence of the cerebellum (fig. 1).

Case 2—Agenesia of Vermis Cerebelli in a Lamb

The subject was a 7-day-old grade lamb, female, brought in by the owner on February 22, 1939. The animal was born on February 20 and was unable to stand. There was no evidence of paralysis but the lamb had no control of the legs. She lay on her side, did considerable kicking and swung the head back and forth laterally. Except for this swinging of the head and the lack of equilibrium, the patient appeared normal. The appetite was good. When asleep, she appeared perfectly relaxed. Euthanasia was performed on February 27.

Autopsy Findings—No gross changes were observed in any of the internal organs except the central nervous system. When the head was removed, it was observed that the cerebro-spinal fluid was abundant and under considerable pressure. Except for some congestion of the meninges, the cerebrum appeared normal. The two hemispheres of the cerebellum were present and seemed to be normal, except for possibly a reduction in size. The vermis cerebelli was completely lacking (fig. 2) so that the hemispheres were separated by a space filled with fluid.

Fig. 1. Microgyria of the cerebral hemisphere and absence of cerebellum (x 6/5).

Case 3—Agenesia of Cerebellum and Gall Bladder in a Kitten

The subject was a 2-week-old kitten, male, with a history of having never been able to walk. The animal appeared to be fairly well developed but exhibited a definite disturbance of equilibrium. Euthanasia was performed.

Autopsy Findings—There was a rather marked icterus throughout the subcutaneous tissues. The gyri cerebri of the cerebrum had a peculiar appearance, being very smooth. There was considerable space between the cerebrum and the cerebellum.

Fig. 2. Absence of vermis cerebelli (x 6/5).

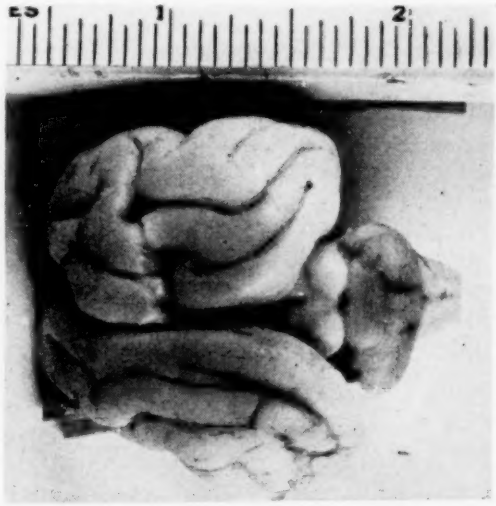

Fig. 3. Agenesia of cerebellum (x 6/5).

(See figure 3.) The corpora quadrigemina were not covered. The cerebellum was much smaller than normal. The liver was of an abnormally light color. There was complete absence of the gall bladder. The large bile ducts were much distended. There was apparently no biliary communication between the liver and the small intestine.

(*Continued in next column*)

Mad Itch (Aujesky's Disease) in a Dog

By J. H. BROWN, D.V.M.
Tarboro, N. C.

AN OPPORTUNITY was recently afforded the writer to observe a case of mad itch in a dog. Since Aujesky's disease, or mad itch, occurs but rarely in the dog, this incident seems worthy of report.

The affected animal was brought in by a vocational agricultural school teacher who was acquainted with the owner. He had taken an interest in the case and had attempted to treat it, but without success. The writer diagnosed the condition as mad itch and when the teacher was informed of this, he became greatly alarmed over the possibility of rabies. However, a report negative for rabies, submitted by the state laboratory of hygiene, dispelled his fear.

The day previous another of the owner's dogs died of apparently the same malady after being sick for 12 to 18 hours. The subject was of mixed breeding and weighed 30 pounds. In the morning he was observed to be in a highly nervous state. He ran around, pawed at the right side of the face, and rubbed it against the ground. When the case was brought to the writer that evening, practically the entire right side of the face was raw. The animal was in convulsions and opisthotonos was marked. Death followed a few hours afterward.

It is known that this disease was first described by Aujesky of Hungary in 1902. Mad itch is also called pseudorabies and infectious bulbar paralysis. It is caused by a virus but the method of natural infection is not known. Some investigators believe that rats transmit the virus. A successful treatment has not been found and the mortality is 100 per cent.

Feline Septic Metritis Treated Successfully with Sulfanilamide

By HENRY GORDON, D.V.S.
Bronx, N. Y.

A CESAROTOMY was performed on a Siamese cat, February 18, 1939. No uncommon difficulties were encountered and, within a few hours, the animal was resting easily, exhibiting no ill-effects from the ether anesthesia.

On the morning of the 19th, ten hours after the operation, the cat still appeared normal. The temperature was 102° F., and the pulse, heart beat, and respiration were normal. The animal cared for her kittens.

Late in the afternoon of the same day, however, the patient became restless. The kittens seemed to annoy her and they were immediately removed. The temperature rose to 103.6° and the pulse and respiration increased. The visible mucous membranes were congested; the vulva and vagina were swollen and red; there was a slight mucopurulent, blood-stained discharge; tenderness was detected in the region of the womb; and the animal refused nourishment. The symptoms were all indicative of endometritis.

An examination of the patient on the following morning revealed that the condition was growing steadily worse. The temperature was 105°; the uterine mucopurulent discharge was copious and of an offensive odor; masses of blood-stained pus were discharged freely from the vagina and vulva; and the animal began to vomit, becoming very weak. The inflammation of the endometrium apparently extended to the muscular coat and the serosa of the uterus, causing an acute, generalized septic metritis.

On February 21, the symptoms were even more pronounced. The temperature was 106.6°; the pulse was weaker and the respiration more shallow. The animal either lay quietly or walked stiffly, with a staggering gait. It vomited constantly and grew alarmingly weak. Undoubtedly, the acute septic metritis had become associated with puerperal septicemia. It seemed that the animal was near death. At this time, a sample of the discharge from the vulva was collected for culturing under the most sterile condition possible.

Treatment—Prior to February 21, the treatment consisted solely of hypodermic stimulants, such as caffein, physiological saline solutions, and liquid forced feeding. On the 21st, in advance of the laboratory report on the discharge, 5-grain doses of sulfanilamide were administered orally every two hours until 30 grains had been given. No other treatment was employed on that day.

There was remarkable improvement the following morning. The temperature had dropped to 103° and, within the next few hours, declined to normal. The uterine discharge began to disappear; the abdominal tenderness eased; and the patient grew steadily stronger.

Towards the evening, the cat accepted some liquid nourishment and began to walk with a steadier gait. The vagina and vulva gradually shrunk to normal size and appearance. The sulfanilamide treatment was continued. Twenty grains were administered during the day, thus bringing the total dosage to 50 grains.

On February 23, the animal was greatly improved and, on the 24th, the symptom complex had disappeared entirely.

The laboratory report on the discharge showed a mixed infection of *Streptococcus haemolyticus* and *Staphylococcus aureus.*

The writer hopes that many of the readers will profit by his mistake in delaying the sulfanilamide treatment for 48 hours after the symptoms were observed. Through early administration of maximum doses of this drug, the infection can be localized and extension of the inflammation avoided. Since handling this case, the writer has successfully treated several cases of metritis in both dogs and cats, the metritis being

the result of protracted labor, dystokia, and retained placenta.

In conclusion, it seems expedient to call attention to the toxicological symptoms of sulfanilamide treatment, namely, cyanosis of the visible mucous membranes and severe urinary disturbances. The only antidote now known is a 1 per cent solution of methylene blue, 1 cc. of which is injected intravenously for each 3 pounds of body weight.

Carcinoma of the Prostate in a Scottish Terrier

By LEON ROTH, D.V.S.
New York, N. Y.

THE SUBJECT was a 12-year-old Scottish Terrier, male, with a history of continual straining during defecation for about one month. The appetite was very good but the animal was losing weight.

Fig. 1. Prostate mass of the affected dog.

Palpation of the abdomen revealed a hard, nonfluctuating mass about 4 inches in diameter. A laparotomy was performed and a large tumor was found involving the prostate with evidence of metastasis to the bladder and kidneys. Euthanasia was performed.

Diagnosis—Carcinoma simplex, prostate.

A microscopic sectioning of the carcinomatous mass (fig. 1) revealed a fine, reticular stroma, and in the small interstices of this there were immature, undifferentiated epithelial cells. The appearance was essentially that of a histoid growth, sacromatous in type. In the better preserved portions the clusters of epithelial cells were more conspicuous. Invasion of the nerve sheaths and lymphatics was observed. Many of the epithelial cells exhibited bizarre mitotic figures and vacuolated cytoplasm. These cells varied markedly in size and shape and stained deeply.

Cod Liver Oil as a Cicatrizant

In the light of published articles and observations collected in the past four years, it seems reasonable to laud cod liver oil in the highest terms as a dressing for wounds. Its richness in vitamins A and D and its physical and chemical properties are said to account for its value in this rôle.

For diseases and injuries of the cornea and sclera, this inexpensive oil has been praised for its healing properties by high authorities in human and veterinary medicine. As a teacher of veterinary pharmacology said recently, "Certainly, something should replace the overtouted yellow oxide of mercury in the treatment of ocular diseases," and in an article entitled, "Therapeutic Utilization of Cod Liver Oil in Ophthalmology" (translated title, by Darrasen, Chelle and Florio*) cod liver oil renders an important service in practically all of the common eye affections of the different species of animals. To these authors it has no near peer in the treatment of ulcerations of the cornea associated with canine distemper (Carré's disease).

The breeding of dogs is the only animal industry of this civilization that does not castrate its males to regulate reproduction and capacitate them for a more useful life.

*Revue de Médecine Vétérinaire, cx (Dec., 1938), pp. 686-689.

Generalized Fat Necrosis

By C. C. MORRILL, D.V.M., M.S.
Department of Veterinary Pathology
Kansas State College, Manhattan, Kan.

THE TERM "fat necrosis" is used to designate death of adipose tissue followed by splitting of the cell fat into its components, and the subsequent combination of the fatty acids with calcium salts to some extent. These facts were established by Langerhans about 1890.

ETIOLOGY

The experimental work of others, notably Wells, has since brought out the fact that fat necrosis is caused by enzymes and can be produced quite regularly by the injection of emulsion of fresh pancreas or commercial pancreatin. These may be from homologous or heterologous species. The condition may occur naturally as a result of anything which allows the pancreatic juice to escape from its normal confines. It is thought that the trypsinogen of the pancreatic juice is activated by a "kinase," either produced by leukocytes or, more likely, developed in the pancreas by autolysis. The trypsin is evidently responsible for the necrosis and the pancreatic lipase for the subsequent fat splitting.

SIGNIFICANCE

Fat necrosis *per se* is not particularly dangerous to the animal and may not cause observable symptoms; also, if the causative factors are removed, the lesions may disappear within a few weeks. The danger lies in the condition which causes the fat necrosis. Retrogressive, inflammatory, and traumatic changes in the pancreas and conditions bringing about stasis of its secretions are included as causative factors, and a more or less localized fat necrosis is quite commonly seen at autopsy, involving especially the peripancreatic, perirenal, mesenteric or omental fat. The human, porcine, canine, equine, and bovine species are mentioned as being most frequently involved. Since autolysis of the pancreas occurs soon after death and may result in a condition which greatly resembles intravital fat necrosis in gross, it is very probable that many of these cases represent postmortem phenomena.

Fig. 1. Fat necrosis involving subcutaneous and intermuscular fat.

LESIONS

The condition is manifested by the appearance of multiple, irregular, grayish-white areas in the fat. They are usually small and somewhat opaque, and present a dry, soap-like cut surface. They may or may not be surrounded by a zone of hemorrhage, this feature being suggestive of recent formation. Microscopically, the fat cells contain crystals of fatty acids or finely

Fig. 2. Widespread necrosis of subpleural and subperitoneal fat. Note the hemorrhagic areas surrounding some of the foci of subpleural necrosis.

granular or homogeneous material, the staining properties of which depend upon the concentration of calcium present. The fat-cell nuclei are extremely scarce or entirely lacking. Leukocytes often infiltrate the fatty tissues immediately surrounding recently formed patches. This feature and that of peripheral hemorrhage may sometimes aid in differentiating between the antemortem and postmortem change. Later, in repair, considerable proliferation of connective tissue may occur.

PROTOCOL

The case under discussion was a 10-month-old Duroc Jersey gilt weighing about 200 pounds. When presented for diagnosis

Fig. 3. Extensive necrosis of omental and mesenteric fat. Note the hemorrhage within the latter. The spleen may be slightly enlarged but this feature is exaggerated by comparison with the contracted stomach.

and treatment, the chief symptoms observed were anorexia, weakness, lameness with swelling of several joints, constipation, and a temperature of 104.4°. There was a history of lameness in one hind limb, becoming evident several weeks previously, and of inappetence for two days. The rapid plate agglutination test for swine erysipelas was positive, and, on the strength of this test plus the history, anti-swine erysipelas serum was administered. Treatment was without avail and, five days after admission to the hospital, the animal died.

Postmortem examination revealed no significant gross lesions involving the circulatory, digestive, or urinogenital systems in themselves. Microscopically, however, the pancreas showed extensive retrogressive changes and considerable interlobular and intralobular infiltration of cells of the lymphoid and macrophage types. The spleen may have been just slightly enlarged. Several joints were swollen and contained excess fluid which was quite turbid and which, on bacteriological examination, yielded staphylococci.

The most striking lesion was that of fat necrosis involving the fat in practically all depots of the body. That found in the intermuscular and subcutaneous fat (fig. 1) existed in irregular foci, up to about 5 mm. in diameter, which showed very few hemorrhagic borders. The fat beneath the parietal layers of the pleura and peritoneum contained patches which were somewhat larger in size. Many of those in the subpleural fat were surrounded by rather wide zones of hemorrhage (fig. 2). Many of the necrotic foci in the mesenteric fat were surrounded in a like manner, but there was little evidence of hemorrhage elsewhere (fig. 3).

The fat necrosis in this case was undoubtedly due to the pathological condition of the pancreas, but whether the latter was identified etiologically with the polyarthritis was not determined. While the lesions of fat necrosis were typical in character, they were somewhat unique in their extent and distribution, and the case is deemed worthy of reporting for that reason. The manner in which the etiological enzymes became so widely distributed is a matter for conjecture. The focal nature of the lesions denies their spread by direct diffusion, and leaves the lymphatics and the cardiovascular system as the more likely channels.

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An Inquiry on Sellanders in the Horse

I am enclosing photographs of a case in a Percheron stallion under my care. When this case was brought to my attention, I diagnosed it as "scratches." The owner has several other horses that were similarly affected but they recovered after treatment. However, their "scratches" were about the fetlock.

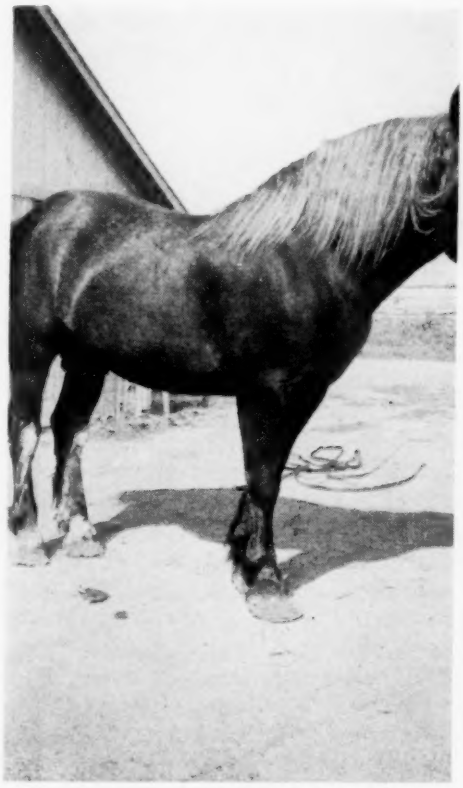


Fig. 1 (left). Eczematous eruptions of the flexion surface of the tarsus (sellanders). Fig. 2 (right). Detail view of figure 1.

I prescribed the treatment in November of 1938 and, since I was not called again during the month, I assumed that all of the horses had made a recovery. But, early in January the owner informed me that the Percheron stallion was still affected. He explained that he had been using various remedies, without success. My efforts in the treatment of this condition have also failed to produce any noticeable improvement, as you will observe in the accompanying photographs. I have consulted several other veterinarians about the case but none has been able to recommend a successful treatment.

While I am not engaged in large animal practice, the owner is a friend of mine and, therefore, I should like to help him. At the present time I am using zinc oxide and glycerin, as you will observe from the white color on the affected leg. These areas are very swollen and indurated. The crosses marked on the detail view indicate open wounds.

If you can give me an idea as to how this case should be handled, from what I have told you and from what you can see in the photographs, I shall be indebted to

you.—*J. A. Bogue, D.V.M., Wichita, Kan.*

Reply: We have your letter and the enclosed photographs of the horse suffering from sellanders, which is the old name given to the dermatitis affecting the hock of horses in the fashion shown in the photographs. This is a serious disease, difficult to cure unless treated before an excessive amount of fibrous tissue is formed.

Our treatment is to keep the animal in a standing position for 30 days and to apply freely, three or four times a day, liberal douchings of hydrogen peroxide. The object of this treatment is to prevent the formation of hard edges on the crevices, and the standing position is of course intended to prevent flexion of the limb. This is a difficult treatment but is the only one that affords any measure of success.

Embolism of the Radial Artery in a Thoroughbred

By H. C. CRAWFORD, V.M.D.
Jamaica, Long Island, N. Y.

A 2-YEAR-OLD thoroughbred colt mounted another colt while romping in a paddock. The latter swerved sharply, with the result that an extreme abduction of the off fore limb was produced in the colt in question.

This locomotory inconvenience did not become pronounced until ten days later, when distention of the artery was observed, which obviously was brought about by the thoracic limb affection. It was apparent that the endarteritis had been produced by extraneous traumatic factors. It might be stated that the colt had received ample treatment for strongylosis in advance of the mishap.

Very few parallel cases have been reported in the literature.

Prohibiting the production of Brucella bacterins several years ago by the federal bureau of animal industry has proved to be a wise measure, since research and experience have since shown that these products possessed but little immunizing value.

Intestinal Disorder in a Sow Complicated by Fetal Impaction

By JOHN B. BRYANT, D.V.M.
Mount Vernon, Iowa

THE WRITER was called to administer a laxative to a 400-pound sow with a litter of five 4-day-old pigs.

The vulva was soiled with a heavy white discharge, which suggested involvement of the reproductive organs. The involved parts were thoroughly cleansed and lubricated and some impacted feces were removed. A mass was palpated which was not in the rectum but below it. Careful exploration showed this to be a pig's head.

Vaginal palpation revealed a severe constriction of this passage, and thorough lubrication and careful manipulation were required to dilate it.

If the rectum had not been explored, one might logically have assumed that the discharge was due to a metritis and accepted the owner's diagnosis of constipation. After the nose of the fetus was located, a heavy bovine uterine forceps was inserted and fastened to the decomposed mass. Lubrication, dilation, and judicious traction finally dislodged the fetus and, upon removal, much putrid tissue débris (probably placenta) and mucus were emitted. Rectal lavage removed a quantity of solidified fecal material.

About 3 ounces of Epsom salt was administered orally in 1½ pints of water. About three hours later, the sow passed another fetus without assistance. A complete recovery followed.

The Veterinarians of Germany

As of January, 1939, according to *Weiner Arzliche Monatschrift*, there are 7,619 veterinarians in Germany, of whom 4,177 are private practitioners, 144 teachers, 1,014 abattoir inspectors, 293 engaged in scientific concerns, and the rest are public functionaries or retired. These figures apply to the old Reich, including the territory of the Sarre, but not the more recently acquired jurisdiction of that country.

Impaction in Horses Due to Ingestion of Pea Straw

By WM. R. KERMEN, D. V. M.
Pocatello, Idaho

THROUGHOUT the Palouse Valley the field pea is widely grown. It is not a major money crop but is secondary to wheat. The soil and climate there are advantageous for its growth. After the peas are threshed the straw is stacked and used as roughage for the horses throughout the winter months.

Pea straw has a high fiber content and, due to this fact, it is held accountable for 90 per cent of all the gastrointestinal troubles of the Equidae in this region. Often the mortality is high.

HISTORY

It is natural that impaction should take place during the winter months. The possible sites of the obstipation are the pelvic flexor, floating colon, cecum, and rectum. By rectal palpation the pelvic flexor may be recognized by a band along its lesser curvature; the floating colon by its size, saculations, and bands; and the cecum by its size and shape. Impaction is found in animals of all ages. Animals with poor teeth and animals that are heavily infested with *Strongylus vulgaris* are more frequently affected. However, it is not uncommon for horses of all ages to suffer.

SYMPTOMS

Impaction of the pelvic flexor develops slowly. Peristalsis is retarded; the intestinal contents become firmer and of greater mass. They become in most cases very hard. In the course of several days the animal stops feeding and shows colicky pains, that is, generally speaking, the animal becomes restless at first and often begins to paw and kick. Defecation is either retarded or completely stopped. The mucous membranes become injected and appear deep red.

The Cecum: There is complete suppression of peristalsis. The animal shows the general colicky symptoms. There may or may not be a change in pulse, respiration, and temperature, depending on how long the case has been allowed to progress. There may or may not be small evacuations. Rectal examination reveals a greatly distended cecum. The degree of distention is in most cases very great and the organ is smooth and tense.

Floating Colon: In the early stages of impaction of the floating colon the pulse remains unchanged, becoming full and accelerated only during the periods of pain. Most of the time it is about normal, except in cases that are allowed to progress to a stage of exhaustion before the animal is treated. Auscultation of the abdominal walls reveals not the slightest sign of peristalsis. Sometimes there is an accompanying slight tympany and, during auscultation, we may then hear a peculiar tinkle, caused by some feeble attempt of the bowel at peristalsis. At times the animal will paw, become restless, lie down, and get up a few minutes later. It may make frequent attempts to defecate and urinate. In very advanced cases they begin to throw themselves and roll in great pain. Rectal examination reveals the pack in the floating colon.

We have found the following treatment to be of great value and it is used in nearly all cases of impaction due to pea straw: Administration per stomach tube of 1½ quarts of mineral oil (heavy), one ounce of aromatic spirits of ammonia, one ounce of turpentine, and one-half ounce of fluid extract of nux vomica. Repeat the dosage every day but reduce or withhold the nux vomica according to the symptoms of the animal. The pack is massaged daily and a high enema of warm salt solution (one ounce to a gallon) is given. On the second or third day, if no bowel movement is noticed, one-quarter grain of lobeline sulfate may be given and increased to one-

half grain on the second day. Usually this brings about the required action.

DISCUSSION

Impaction of the intestine is the most frequent cause of intestinal disturbances in horses and happens mainly during the winter months, when the horses have to feed on pea straw. Impaction of the pelvic flexor, cecal impaction, and impaction of the floating colon are very common in the writer's district. Impaction of the rectum and small intestine is not frequent, but it is not uncommon. Impaction due to pea straw presents a baffling problem both in regard to successful treatment and prognosis.

DIFFERENTIAL DIAGNOSIS

Differential diagnosis is made by rectal examination, and the duration of the pack can usually be recognized by the color of the mucous membrane. Impaction of the small intestine comes on rapidly and colicky pains are suddenly shown. Other general symptoms are seen earlier, such as increase in pulse and respiration. In impaction of the pelvic flexor and floating colon, the symptoms are more intensified than those of cecal impaction and the duration of the attack is less.

DIAGNOSIS

A diagnosis of impaction is made from the history, statistics, colicky pains and retardation of defecation. A rectal examination is always made to substantiate any physical examination of a patient.

TREATMENT

All known treatments for impaction of the horse have been tried with no great success. The packs found in the pelvic flexor and floating colon are so hard that it is next to impossible to crease them and try to form a groove. Injections of warm water into the rectum aid in massaging them. We have found that administration of arecoline hydrobromide subcutaneously is contraindicated. The mixture of calcium chloride and sodium bicarbonate and water given by stomach tube in an effort to blow out the pack results in failure in most cases. Even injections into the pack prove worthless in obstinate cases.

PROGNOSIS

The prognosis in impaction due to pea straw is always doubtful. In early cases, under specific treatment, the prognosis is fairly good. Unfortunately, however, if the animal is cured and returned to the owner with the specific instructions of no more pea straw, it will be back in a couple of weeks with another pack. Since the weather is cold and the straw stack is near, the horse eats some more pea straw. The general result is that the mucosa and muscularis, where the former pack was, are greatly fatigued, and probably necrosed. Hence another pack is formed in the same place. Following repeated attacks, pathological changes take place and lead to the rupture of the bowel and death of the animal.

PREVENTION

A change of forage is the best method of prevention, but this is virtually impossible. After the first pack has been removed, the animal should be placed on green feed and no straw given. Administer mild laxatives to keep the bowels moving.

Animal and Human Conflicts

Says Alan Devoe in "Un-Natural History of War," "If war is inexcusable why not apologize for our War of Independence? This country was born in war, was preserved by war, and will probably have to fight many wars in the future if it intends to survive. . . . If there exists a deep-rooted spirit of harmony, why does it not assert itself? . . . Like it or not, conflict is not confined to the animal kingdom. . . . It (war) flourishes in spite of our cries for peace, when there is no peace, and will probably function as long as life itself."

Toxicity of the Coffee Bean (Sesbania Vesicaria) for Sheep

By I. B. BOUGHTON, D.V.M., and W. T. HARDY, D.V.M.
Substation No. 14, Sonora, Texas

AN OUTBREAK of fatal poisoning in a farm flock of sheep which were eating the ripe seeds of the coffee bean plant, *Sesbania vesicaria*, was called to our attention during the latter part of February, 1939. The characteristic symptoms were profuse diarrhea and intense abdominal pain. As a rule, death occurred within twelve to 24 hours after the animals showed the first signs of distress.

Since there seems to be a difference of opinion among botanists as to the generic and specific nomenclature of the various coffee-bean plants, the writers asked V. L. Cory, station botanist, to clarify this situation for the lay reader in his botanical description of *S. vesicaria*. Apparently the generic names Daubentonia and Sesbania can be used interchangeably, at least, as far as the veterinarian is concerned.

Botanical Description*

References to studies of the toxicity of *Daubentonia longifolia* for the most part do not apply properly to that species. With one exception, when the work was conducted in the United States, the species concerned is the one known either as *Daubentonia Drummondii* Rydb. or *S. Drummondii* (Rydb.) Cory. The exception is the work reported in Bulletin 156 of the Florida Agricultural Experiment Station. Seed of the plant concerned was sent by the Florida Agricultural Experiment Station to the Texas Agricultural Experiment Station, and plants grown from these seeds at San Antonio by H. B. Parks, and at Sonora by V. L. Cory, proved to be the species known either as *D. punicea* (Cav.) D. C. or *S. punicea* (Cav.) D. C. The species longifolia is now known only from Mexico. Two other species of Sesbania occur in Texas, one, *S. exalta* (Raf.) Cory, being somewhat common in central, eastern and southern Texas, and the other, *S. sericea* (Willd.) Link, a native of Ceylon, has been introduced in Houston, Texas, and also in the West Indies and South America.

S. vesicaria (Jacq.) Ell (*Glottidium vesicarium* Harper) is a tall, 1 to 3 m. high, smooth, branching annual with firm, woody stems. The leaves are 10 to 15 cm. long, pinnate, with numerous (20 to 52) leaflets. The leaflets are oblong, rounded, and short-pointed at the apex, short-petioled, 1.5 to 4 cm. long and 3 to 6 mm. broad.

The flowers are in axillary, slender racemes, which usually are simple but sometimes are compound, 8 to 12 cm. long, with 5 to 15 flowers. The calyx is about 3 mm. high and broad, with the five lobes acute and shorter than the tube. The corolla is yellow, the five petals subequal in length, and the standard with a reniform blade. The pod is short and wingless, elliptical-oblong, compressed, and acute at each end, the body being 5 to 6 cm. long and 1.5 to 2 cm. broad, with a short beak and a stipe 1 cm. long. It is one-celled, two-valved, and two-seeded, and the valves at length separate into two layers, the outer thick and leathery, the inner very thin and membranous, or bladdery, the outer coriacaous portion opening up or falling away, leaving the two seeds enclosed in the thin, white inner membrane. The seeds are oblong-reniform, dull, 1 cm. long and nearly 5 mm. high.

The plant grows in rich, damp soil of the Coastal Plain from North Carolina and Florida to Texas. In the latter state the plant has extended its range several hundred miles north and is well distributed as far northwest as the southern half of Palo Pinto county, especially along streams and ditches. The woody stems persist throughout the winter, with the bladdery pods dangling from the branches. It may easily be eradicated from pastures by hoeing up

*By V. L. Cory, botanist, Texas Agricultural Experiment Station.

the young plants or by pulling or digging the mature plants.

LITERATURE

It has been known for several years that the seeds of several species of Sesbania (Daubentonia) were poisonous for grazing animals and poultry. Schmidt[1] in 1918 at the Texas station, investigating heavy death losses in a flock of Angora goats grazing along the highway where *S. Drummondii* was the only available vegetation, demonstrated by feeding tests that the losses resulted from consumption of the ripe seed of this plant. Marsh and Clawson[2] reported the toxicity of the seed of *D. longifolia* for sheep, stating that slightly less than two ounces of the seed constituted a fatal dose for mature animals. Shealy and Thomas[3] reported on the toxicity of Daubentonia seed for poultry. They found that chickens are extremely susceptible to the poison contained in these seeds.

Robey[4] isolated a sapotoxin, corresponding to the formula $(C_{18}H_{28}O_{10})X$, from the ripe seeds of *S. longifolia*. This investigator also concedes the probability of the seed containing an additional toxic principal.

As far as the writers have been able to determine, no feeding trials of *S. vesicaria* seed have been reported previously.

While the minimum lethal dose of seed was not determined definitely, the results of the tests conducted (table I) indicate that this lies somewhere between .0,625 per cent and .03,125 per cent of the body weight (sheep 206 and 208).

Sheep 208 and 209 were extremely sick for about ten days subsequent to seed feeding. They improved rapidly thereafter and were released as healthy on the 16th day.

SYMPTOMS

The time of the appearance of symptoms of poisoning apparently depends upon the quantity of seed eaten and varies from a few hours to at least two days.

First symptoms are uneasiness, sluggish movements, depression, arched back and frequent urination. The urine is clear in color and copious in quantity. (In this connection it is interesting to note that in some parts of eastern Texas a tea made from the leaves of one species of Sesbania is used as a diuretic.)

The appetite is lost completely. A nasal discharge, mucous in character, usually is present and a severe diarrhea invariably develops within 24 hours or less. Respiration becomes shallow and rapid and each expiration is accompanied by a deep groan. The pulse becomes fast, irregular, and thready as the case progresses. The temperature is invariably subnormal several hours before death. Finally, the animal goes down and dies after a period of coma lasting one or two hours.

TABLE I—Feeding experiments on five sheep.

SHEEP	WEIGHT (LBS.)	AMOUNT FED (GRAMS)	% BODY WEIGHT FED	FIRST SYMPTOMS (HOURS)	RESULTS
203	92	104.00	.25	8.5	Died—22 hours
204	99	56.00	.125	18.0	Died—34 hours
206	99	27.00	.0,625	24.0	Died—56 hours
208	57	8.00	.03,125	24.0	Recovered—16 days
209	52	3.67	.0,156	48.0	Recovered—16 days

The temperature is invariably subnormal several hours before death. Finally, the animal goes down and dies after a period of coma lasting one or two hours.

PATHOLOGICAL FINDINGS

The lesions described were found at the autopsy of sheep 203, which died 22 hours after consuming .25 per cent of its body weight of seed.

The blood was tar-like; it stained the hands and was not coagulated. The heavily engorged blood vessels gave the subcutis a very dark, almost black color. Of the lymph glands, the gastric and mesenteric were hemorrhagic. The lungs were normal

on gross inspection. The heart, which had stopped in diastole, showed multiple petechiae and ecchymoses externally and a few small hemorrhages were found in the wall of the left ventricle.

The rumen showed no appreciable changes but an increasingly severe gastritis was traced through the reticulum and omasum into the abomasum, which was deeply inflamed and dotted with hemorrhages. The inflammation was especially marked around the pyloric opening.

The small intestine, cecum and large intestine showed severe hemorrhagic enteritis throughout, although the inflammation was notably milder in the last twelve to 14 inches of the colon. Feces were liquid but contained no blood.

The liver was extremely friable and deeply congested throughout. Grossly the gall bladder was normal both in size and in the quantity of bile it contained.

The spleen was normal in size, mushy in consistency, almost black, and showed a few petechiae on the parietal surface. The kidneys were friable and deeply congested. The bladder was about full of urine.

Lesions in the animals receiving smaller amounts of seed were merely milder expressions of the changes noted above.

TREATMENT AND PREVENTION

Obviously, no treatment of the experimental cases was attempted but the rapidity of the poisoning and a lack of complete knowledge of the toxic principals obviates the probability of any satisfactory treatment. Theoretically, lavage of the stomach and administration of demulcents are indicated in this type of poisoning, but the writers' experiences with most plant poisonings among sheep emphasize the futility of such procedures in the overwhelming majority of cases.

Grubbing or pulling the plant and collection and burning of the seeds offer the only means of prevention from a practical standpoint.

SUMMARY

Three mature sheep were fatally poisoned by feeding them .25 per cent, .125 per cent, and .0,625 per cent of their body weights, respectively, of the ripe seed of *Sesbania vesicaria*.

Two yearling lambs, consuming .03,125 per cent and .0,156 per cent of their body weights of the seed, respectively, were severely poisoned but gradually recovered within 16 days.

References

[1]Schmidt, H.: 1918, Cited by Robey[4]; also personal communication.

[2]Marsh, C. D., and Clawson, H. B.: *Daubentonia longifolia* (coffee bean), a poisonous plant. U. S. D. A., Jour. Agr. Res., xx (1920), 6, p. 507.

[3]Shealy, A. L., and Thomas, E. F.: Daubentonia seed poisoning of poultry. Bul. 196, Agr. Exp. Sta., Univ. of Florida.

[4]Robey, A.: Isolation of the toxin of *Daubentonia longifolia*. Thesis, Texas A. & M. Coll., p. 11.

Lest We Forget The Cost of War*

The total strength of the American Expeditionary Forces was 1,981,701 men of all departments and services. The navy furnished 32,385 marines.

Of these, 646,000 were infantrymen and machine gunners; 278,500 artillerymen; 152,300 medical corps personnel; and 34,800 were enrolled in the air service.

There were no American-made cannon, shells or tanks used by the expedition. All of these were procured from the French or British. The A. E. F. used up 302,292,443 rifle cartridges; 21,385,164 pistol cartridges; 2,724,229 one-pound shells; 1,983,937 heavier artillery shells, 7,550,835 French 0.75 shells, and 2,724,607 grenades.

From April, 1917, to May, 1919, the cost of the World War averaged $1,000,000 an hour. Including about $10,000,000 loaned to the allies, the total cost of the War (to the United States) was $22,000,000,000, or more than the whole cost of operating the government from 1791 to 1914.

*The National Legionnaire, v (June, 1939), p. 1.

CURRENT LITERATURE

ABSTRACTS

Formolated Abortion Bacterin

An article entitled, "New Results Obtained from Experiments on the Prevention of Epizoötic Abortion in Cows with a Formolated Vaccine," published in *Deutschetierarzliche Wochenschrift*, contains interesting data on the use of a new bacterin tested on a large scale for its merits in decreasing the incidence of abortion. The organisms were gathered from different regions and cultured in a media of meat, heart, liver, spleen, and kidney of cattle, and killed by careful fractional heating and formalin, 1:1,000. The product was set aside for several days at a temperature of 37° C. to insure that the culture was killed.

A single injection of this bacterin in negative animals produced a positive sero-agglutination reaction that persisted for six to eight weeks (twelve weeks after a double dose), to disappear completely after that time.

In newly infected herds containing 1,633 head, of which 29.8 per cent were positive and 19.3 per cent had aborted, one injection reduced the incidence of premature births to 0.6 per cent during the next gestation. Twelve blood and milk negatives, treated with a dose of 50 cc. of the bacterin, yielded seven negatives and five positives 13 weeks later. In 24 weeks, nine were blood-negative, two were positive and one was doubtful. The milk of these same animals was negative 13 weeks after vaccination. In one of the blood-positive animals, the milk was positive for two quarters and doubtful for the other two. Twenty-four weeks after vaccination, eleven of these animals were milk negative while one was milk negative at the first test and milk positive for two quarters folfowing infection by Bang's bacillus.

Ten of the blood- and milk-negative cows before vaccination, treated with a double dose (100 cc.), showed five blood positives and five blood negatives at the end of 13 weeks. At the end of 24 weeks following vaccination, seven animals were blood negative, three blood positive. The latter were infected after the treatment had been given. The milk of these ten animals was negative in both the first and second tests, 13 and 24 weeks apart.

One animal, blood positive before vaccination, was still a reactor 24 weeks after treatment with a double dose. It was milk positive for one quarter, the milk of which showed also the presence of Bang's bacillus.

Essentially the same results were obtained in two other series of tests, one comprising 1,517 animals, and the other, 425. *(F. Kress (translated title cited above). Abstract from Recueil de Médecine Vétérinaire, cxv (March, 1939.)*

Grass Tetany of Cows

Grass tetany does not affect stabled animals. It is a malady of pastoral animals—of animals consuming food containing chlorophyl, therefore, magnesium. The disease occurs mainly in heavy milkers—animals eliminating large amounts of calcium and phosphorus—or in young animals whose phosphorus metabolism is very active. It generally occurs two or three weeks after the cows have been turned out. Cold nights, estrum and fatigue are exciting causes.

While only certain subjects among those exposed to tetanogenic pastures are affected, Blakemore and Stewart (1935) found that all animals after a certain sojourn in such pastures presented hypomagnesiemia, notwithstanding that a chemical analysis of the grass showed that it was extremely rich in magnesium. Ex-

planation: The heavy intake of manganese lowers blood magnesium. This was proved by experimental administration of manganese to ewes, rabbits and cows. Although the experimental animals did not develop convulsions, they showed hypermanganesemia and hypomagnesiemia. The action of the parathyroid on the mineral reserve is the determining factor. *(M. Pierre. An excerpt from Endocrinologie parthyroidienne. Revue de Médecine Vétérinaire, xc (Dec., 1938), pp. 672-673).*

Chronic Arthritis in Wild Mammals

Data presented in this treatise indicate that many animals from the lowest order to the primates have arthritis in natural and captive life. The author made the observation that the incidence of arthritis seems to be greater in those animal species which possess a massive torso in contrast to the supporting legs. He directs attention to the fact that the jolt and strain incident to locomotion may be related to arthritis.

The monograph forms a valuable contribution to our knowledge of the disease of captive wild animals and game animals. While it may seem that the subject discussed is of mere academic interest to the practitioner, yet the excellent radiography and radiological interpretations make this study an unusual attraction to every veterinary roentgenologist. *(Chronic Arthritis in Wild Mammals, by Herbert Fox. Trans. American Philosophical Society, n. s. vol. 31, part 2. University of Pennsylvania Press, Philadelphia, 1939. Price, $2.00.)*

Strongyloides Infection in the Dog

The authors describe a case of Strongyloides infection in the dog, probably the third case to be reported in the literature. Over a period of three months the infestation diminished in spite of efforts to increase the degree of infestation. Although Strongyloides of human origin can be readily transmitted to dogs and cats under laboratory conditions, the species occurring naturally in dogs is probably distinct and should be identified as *Strongyloides canis* Brumpt 1922. *(Observations on a Natural Infection with Strongyloides in the Dog. By Donald L. Augustine and D. Garnet Davey. Jour. Parasitol., xxv (1939), p. 117.)*

The Trichinosis Scare

In view of the pains taken nowadays in the preparation of pork products, the chance of contracting trichinosis by eating pork is extremely rare—certainly too rare to justify the unusual alarm that this disease has caused in recent years. The incidence of the disease in grain-fed hogs is less than 1 per cent and about ten times higher in hogs fed on uncooked garbage containing pork scraps. This fact makes it obvious that swine growers should discontinue, in the interests of definite control, the feeding of uncooked pork scraps.

Summer sausages made under the supervision of the federal meat inspection system are either heated or chilled to points where the parasite can not survive. Weiners and balognas, ofttimes incriminated by writers, are cooked in preparation and are therefore safe products in this respect. *(E. S. Dickey. Scarecrows and Reason. The Morrell Magazine, June, 1939.)*

Recruiting for the Ranks of Teachers

The success or failure of a veterinary college rests primarily with the faculty. The good teacher as well as the bad one, be he director of an institute or merely an assistant, may leave his mark on generations of veterinarians. Veterinary medicine, therefore, has an important mission. It must provide teachers who possess character as well as talent. It is not enough that there are assistants; the assistants must be efficient. The best ones, usually, will reach the goal of professorship, but the majority will have to leave the college without reaching this goal.

Specialization is bound to come. One does not acquire specialized training while a student, but after several years of assist-

antship. It is proposed that a veterinarian who has assisted at one or several veterinary college clinics for four or more years should be allowed the title of specialist (in surgery, obstetrics, breeding diseases, etc.). Veterinarians who have been assistants at nonclinical institutions, such as bacteriology or pathology laboratories, should be preferred for appointments to abattoirs or other municipal or governmental institutions for which such training would render them equal. In this manner, the quality of applicants for assistantships may be improved. *(Wissenschaftlicher Nachwuchs und staatstierärztliche Prüfung (Recruiting for the Ranks of Teachers), by R. Götze. Deutsches Tierärzteblatt, vi (1939), p. 187.)*

Gas-Gangrene Antitoxin

A Mayo clinic report describes the surgical treatment of wounds two hours after injury, stating that 10,000 units of polyvalent Perfringens antitoxin and 1,500 units of tetanus antitoxin were used at that time. The dose of Perfringens antitoxin was repeated in twelve hours. There developed in 48 hours, as a result of the extensive laceration, a full blown infection, in spite of the administration of gas-gangrene antitoxin. An important incident of the case was the inability or failure of action of sulfanilamide. The patient had been given 60 grains daily, which demonstrated the lack of prophylactic or therapeutic action in controlling this infection. The antitoxin seemed to control the toxicity and progress of the infection. A total of 100,000 units was given during the course of the disease.

It was concluded, first, that Perfringens antitoxin as a prophylactic measure did not always insure immunity; second, that sulfanilamide is not dependable as a prophylactic and therapeutic agent; and third, that the specific action of the antitoxin was demonstrated.

In the discussion, Hugh Cabot, M.D., expressed the opinion that it was generally agreed essential to give prophylactic doses of tetanus in injuries of this type, and it now seems necessary to include antitoxin in all gas-bacillus infections, especially where contaminated wounds occur in agricultural areas. At least, it will probably be used with greater frequency. [*Case report by H. B. Macey, M.D., in the Proceedings of the Staff Meetings of the Mayo Clinic, xiv (March 22, 1939).*]

J. A. S. M.

Pathogenicity of Endamoeba Histolytica for Kittens

Distinct differences in the pathogenicity of different strains of *Endamœba histolytica* for kittens have been observed. All except one of these strains maintained approximately the same pathogenicity. As yet, no strain has proved to be nonpathogenic. One new strain, a variant of the "D" strain of Dobell, which is probably the oldest strain of *E. histolytica*, in continuous artificial cultivation, has shown approximately the same degree of pathogenicity as another variant of the same strain studied previously.

Interchanging the bacterial flora between the more pathogenic and the less pathogenic strains had no apparent effect upon the pathogenic activity of the amœbae. On the other hand, variations in the suspending media employed in the inoculation of cultures of *E. histolytica* into kittens do apparently affect the pathogenic activity of the amœba. *(The Effect of Prolonged Cultivation on the Pathogenicity of Endamoeba Histolytica for Kittens. By Henry E. Meleney, William W. Frye, and W. S. Leathers. Amer. Jour. Hyg., xxix (1939), p. 61.)*

Angina in Domestic Animals

Among the domestic animals, angina is observed most frequently in horses and dogs. Angina in dogs resembles very much angina in man; there this condition is caused by the inflammation of the pharyngeal tonsils. In horses, however, the seat of the inflammation is the posterior part of the pharynx, and the angina is produced by the inflammation of the air sac lymph nodes.

Tonsillitis in dogs occurs in three forms, a catarrhal, a follicular, and a phleg-

monous type. The duration of the ailment is about one to three weeks. Sometimes, the acute form does not terminate in reconvalescence, but becomes chronic. Sudden climatic changes are very apt to bring on a relapse. A special form of chronic angina is the hypertrophy of the tonsils; which occurs mostly in young dogs. Sequelae of the chronic tonsillitis are: stunted growth, poor state of nutrition, rough skin and haircoat, and a changing appetite. (*Die Angina bei unseren Haustieren (Angina in domestic animals), by E. Gratzl. Tierärztl. Rundschau, xlv (1939), p. 45.*)

BOOK NOTICES

A New Work on Surgery

A book of 190 pages and 198 illustrations on surgery of farm animals, exclusive of horses, by M. Berthelon, assistant professor in the national veterinary schools of France, reminds one of the poverty of such literature on this and other special subjects in this country. The work covers the modern surgery of ruminants, swine, poultry and rabbits with a graphic text and figures which bring the subject up to date in creditable fashion.

As pointed out in the introduction, this particular field offers numerous peculiarities, covering as it does the truly economic side of veterinary surgery and the great differences which exist between the surgical procedures of the various species concerned. There is quite a difference between the surgery of a cockerel, a rabbit, a pig and a bull or cow, not only in the nature of the surgical disease they have but, more particularly, in respect to the technics the surgeon must practice in order to conform to the economy of the situation.

The author's idea in regard to surgical cleanliness is nicely expressed in quoting Cadiot and Almy's timely remark: "La plus petite incision fait à la peau est une porte ouverte aux infections et à la mort" (The smallest incision in the skin is an open door for infections and death). With this point of departure, the book dwells in detail on many ingenious methods of restraint of cattle, sheep, hogs, chickens, goats, and rabbits and discusses the various operations ordinarily performed upon these animals in the course of a practitioner's work. An excellent book for those who read French or for those who keep their libraries in order. (*M. Berthelon. La Chirurgie du Betail et des Animaux de Basse-Cour. Vigot Frères, 23 Rue de l'École-de-Médecine, Paris, VI. 1939. Price, 50 francs.*)

Small Animal Diagnostics

A book entitled, "Index of Diagnosis. Canine and Feline," by Hamilton Kirk, M.R.C.V.S. and Gerry B. Schnelle, V.M.D., covers a part of that field in dictionary form. The main subjects included are arranged alphabetically, with numerous subtitles under each of them when needed to make differentiations. Although the title says nothing of therapeutics, the treatment of most all of the diseases named is described. The confusion brought about by arranging the subjects of such a book in alphabetical order is overcome by cross and general indexing.

Since the authors have had broad and longtime experience in clinical work, the book contains a great deal of practical information based upon their personal work. Little attempt is made, however, to direct the practitioner on the technics of laboratory diagnoses. Directions in this respect are meager. The clinician is advised to employ pathologists and hematologists to confirm his decisions. This idea is not in line with the small animal practitioners of the United States, many of whom employ trained technicians and scientific equipment to develop laboratory diagnostics in their own hospitals.

The book lacks careful editing. Its many infelicities are unfortunately numerous throughout. There is no uniformity in punctuating, capitalizing, italicizing, abbreviating—a misfortune at this day of tapping at the door of scientific society by veterinarians. In this book, carefree writing galore offends the most charitable critic. Such freakish usage as "Staph. Py.

Aureus," "Bac. Coli," "Bacillus Coli," and "Piroplasma Canis" on one page and the right form, "Piroplasma canis," on another are just a few of the examples where modern usage is ignored.

"T. B." is used for tuberculosis; "Epsom salt" is written "Epsom salts"; "c.c." is the abbreviation for cubic centimeter in one place and "c.cm." in another; potassium is sometimes written "pot.," sometimes "Pot.", and at other times "potass."; one sees "pot. nit." and "Pot. Nit." on the same page. The reckless use of lower and upper case initial letters for the names of drugs is habitual throughout the book. "P. Ammon Carb." and "Aqua chloroformi" appear in the same formula. A sentence on page 351 reads: "One can prescribe a mixture containing sodae sal. grs. v, pot. iodide grs. iij, tinct. nuc.vox.m.v, water to ℥1j." In two places sodium bicarbonate is abbreviated "sodae bic."

The search for Negri bodies in "smears of saliva" is mentioned as a means of confirming a diagnosis of rabies; hysteria (fright disease) is regarded as a toxicosis that is "not infectious but slightly contagious"; avitaminoses receive scant attention and blacktongue gets two lines. The latter is not indexed. Proprietary products are recommended without a hint as to their nature. Vetostelin and Parish's Food are two examples.

On the bright side are tables on differential diagnosis that contain extremely useful information, and it would be unfair not to mention that the book contains the views of clever practitioners of wide experience to offset the offending literary features and technical errors. More attention to the common rules of medical writing would have removed the blurs from this otherwise creditable contribution to small animal medicine. (*Index of Diagnosis. Canine and Feline, by Hamilton Kirk, M.R.C.V.S., and Gerry B. Schnelle, V.M.D. 560 pages, 300 illustrations. Williams and Wilkins Co., Baltimore, 1939. Price, $5.00.*)

Surgical Diseases of the Dog and Cat

The fourth edition of Hobday's "Surgical Diseases of the Dog and Cat" is a reprint, with certain interpolations, of an old book that was highly appreciated at the turn of the century, when it was still thought important to define "wound," "antiseptic," and Galen's version of inflammation in every text book on veterinary medicine, and at a time when small animal medicine was but a fringe in the field of veterinary practice.

Old methods and theories, and apparatus belonging to history, are called "modern" in this onetime popular text on the surgery of pet animals. The book is not a reflection of the Hobday and McCunn we know from current literature of 1939. It is the text of the 19th century, to which new material has been added. The picture of "A Modern Operating Theatre for Small Animals" is particularly misleading to the uninformed, and the trough-like top of the tables portrayed elsewhere do an injustice to average small animal surgery in the United States.

No mention is made of novacaine (procaine), which has so largely replaced the old synthetic local anesthetics in recent years, while the hydrochloride of urea and quinine, an admittedly discarded drug, is given a full paragraph. The barbiturate derivatives receive entirely too scant attention in view of their universal popularity and usefulness. The Thomas splint and its various modifications, now widely employed in the reposition and retention of fractures, receives but two lines.

To the student as yet interested only in generalities, however, this book may prove helpful. (*Hobday's Surgical Diseases of the Dog and Cat, by James McCunn, professor of veterinary anatomy, Royal Veterinary College, London. Williams and Wilkins Co., Baltimore, 1938. Price, $5.00.*)

THE NEWS

The Veterinarians of the Month

E. B. Ingmand Joins Secretarial Staff of A. V. M. A.

E. B. Ingmand (Iowa '34), who joined the secretarial staff of the central office on July 1, 1939, in the capacity of assistant executive secretary, is herewith introduced to the membership as a well chosen addition to the administrative and editorial departments of the Association.

Dr. Ingmand, better known to his colleagues as "Gene," has had wide experience and comes adequately prepared for the important duties stretching ahead in the reorganization of the Association's affairs. He brings along a wide and favorable acquaintance with the younger members of the profession and has gained a thorough knowledge of their problems. He has modern, practical ideas on business administration and, above all, possesses the ability to create workable plans and follow them through to successful completion.

E. B. Ingmand

As to Gene's veterinary background: His father is a prominent practitioner, Joseph E. Ingmand (Chi. '06) of Red Oak, Iowa. Following his graduation and up to the time he joined the Association's staff, Gene was engaged in research and literary work with the Allied Laboratories.

His practical experience and college record reflect the kind of solid leadership that his duties with the Association will require. While a student at Iowa State, he served as president of the student chapter of the A. V. M. A.; advertising manager of the yearbook; treasurer of the senior class; and was a member of Beta Theta Pi.—L. A. M.

Lothe Named to Executive Board

Herbert Lothe (Ohio '13) of Waukesha, Wis., has been appointed to the Executive Board of the A. V. M. A. by President Bergman. He will fill the vacancy left by L. A. Merillat, who resigned as member of the Board for District 3 when he assumed the position of executive secretary of the Association. Dr. Lothe, renowned throughout the State of Wisconsin for his skill in cattle practice, will serve until 1943. His jurisdiction comprises the states of Illinois, Indiana and Wisconsin.

Herbert Lothe

Brumley and Cotton Are Victors in Executive Board Elections

O. V. Brumley (Ohio '97) and William E. Cotton (Geo. Wash. '11) were victors in the recent Executive Board elections for Districts 4 and 10.

In the fourth district, which includes Alabama, District of Columbia, Florida, Georgia, Kentucky, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia, Argentina, Bahamas, Bermuda, Chile, Cuba, Dominican Republic, Venezuela, Ecuador, Jamaica, Peru, Puerto Rico and St. Kitts, William E. Cotton of the Alabama Polytechnic Institute,

W. E. Cotton

Auburn, Ala., and formerly superintendent of the federal bureau of animal industry experiment station at Bethesda, Md., was elected for a five-year term.

O. V. Brumley

In District 10, which comprises Michigan and Ohio, O. V. Brumley, dean of the College of Veterinary Medicine, The Ohio State University, was chosen for a five-year term. Dr. Brumley is a past president of the Association and a member of the Reorganizing Committee of the Board, which met in Chicago recently.

Salsbery Succumbs to Encephalomyelitis

Probably all of our readers know of the tragic death on July 7 of Charles E. Salsbery, vice-president of the Jensen-Salsbery Laboratories, Inc., Kansas City, Mo., since the Kansas City papers and Kansas City and Chicago radio stations devoted much attention to the unusual case, and Associated Press dispatches concerning it were published widely throughout the section where encephalomyelitis is considered a hazard to the horses.

C. E. Salsbery

Dr. Salsbery had attended a meeting of the manufacturers of veterinary biological products at the Palmer House in Chicago, June 23, and was selected chairman of a committee to confer with U. S. bureau of animal industry officials in Washington. He was taken ill on the train while returning from Washington, but his ailment was not diagnosed for two days, and by that time his condition had become critical.

An attempt was made to give him encephalomyelitis antiserum, but he was allergic to horse serum to a degree that even minute doses were distressing and alarming. A concentrated horse serum was procured by chartered plane from the Pitman-Moore Company in Indianapolis, but even this could be given only in drops where ounces were required, and Dr. Salsbery's condition became graver rapidly. After he had been unconscious for 36 hours, serum of hyperimmune guinea pigs was tried, the serum from 300 pigs being used as quickly as it could be prepared. The symptoms of the disease were immediately ameliorated as a result of the administration of the guinea pig serum, and within twelve hours the doctor was conscious, his appetite returned, and high hopes were held for his recovery. However, fatal damage had already been done, and after another 12 hours his heart failed and he died the morning of July 7, after an illness of one week.

Dr. Salsbery was born in Michigan in 1882. He was a graduate of Michigan State Normal in Ypsilanti, in which he taught for several years before taking up the study of veterinary medicine at Kansas City Veterinary College, from which he was graduated in 1911. He was assistant pathologist in that institution for a year, and then went with the Eagle Serum Company in charge of production of anti-hog cholera serum. In 1914, with the late Hans Jensen, he organized the Jensen-Salsbery Laboratories, and ever since has had charge of the production of biological products in that organization, which has grown to be one of the largest in the veterinary supply field. Dr. Salsbery was one of the first-rank biologists in the country and enjoyed a national reputation as an authority on swine pathology.

Because of the great publicity which had been given his illness and death, there was a very large attendance at his funeral on July 10.

The funeral was attended by practically all the veterinarians in Kansas City and many from other places, including J. D. Ray, A. C. Drach, and L. H. Ouren, Omaha, Neb.; S. L. Barrett and H. P. Lefler, Fort Dodge, Ia.; Carl J. Norden, Lincoln, Neb.; John H. Gillmann and E. B. Mount, Memphis, Tenn.; C. Herman Beckman and J. T. Jennemann, St. Louis, Mo.; D. M. Campbell, Chicago; S. L. Stewart, Olathe, Kan.; F. L. Seevers, Pleasant Hill, Mo.; A. E. Shikles, Dearborn, Mo.; Kirtley Sears, Maryville, Mo.; Carl A. Schulz, Independence, Mo.; R. Meier, Smithville, Mo., Carl F. Fischer, Garden City, Mo.; A. Kushner, and Wm. Miller, live stock commissioner of Kansas, Topeka, Kan., and others.

Dr. Salsbery joined the A.V.M.A. in 1912. He is survived by his widow and one daughter.

D. M. C.

Program of Memphis Meeting Now in Press

The official program for the Memphis meeting of the A. V. M. A. is now in press and will be mailed during the coming week. All members of the Association and eligible veterinarians throughout the United States will receive a copy.

Final arrangements have been made for all

of the presentations on this five-day program. The Hotel Peabody will be the headquarters for all of the sessions.

Tuberculosis Germs Provide Clue to Synthesis of Vitamin K

In a tremendously important scientific feat four groups of chemists, working independently, on July 16 reported simultaneously the synthesis of vitamin K, a relatively new hemostatic substance. Undoubtedly, thousands of lives will be saved annually through this finding, since it makes the vitamin, difficult to extract from natural substances, available in unlimited quantities.

Chemists of Harvard University, Northwestern University, the Squibb Institute for Medical Research, the University of California, and the St. Louis University coöperated in the project. The Merck Laboratories also helped.

Although vitamin K produces little effect on hemophilia, it does stop bleeding in a large number of less spectacular but far more numerous and frequently fatal diseases.

The vitamin previously was extracted from alfalfa. The chemists made it from coal tar. It is significant that this artificial substance has four times the potency of natural vitamin K.

An Associated Press report which carried a story on this finding pointed out that the clue which set four groups of scientists simultaneously on the trail of the synthesis is even more unusual than the unprecedented fact of four sets of workers all succeeding at the same time on a chemical job that ordinarily takes years. The clue came from tuberculosis germs.

Wooldridge Elected President of Royal College of Veterinary Surgeons

Professor G. H. Wooldridge of Hendon, Middlesex county, England, was recently elected president of the Royal College of Veterinary Surgeons. Carrying the story of Professor Wooldridge's election, the *Times and Guardian* described the position as "the highest honour which can be bestowed in his profession . . . the summit of the British veterinary profession . . . the office of president is comparable to that of President of the Royal College of Physicians."

Professor Wooldridge has written eight books on cattle, besides numerous articles and papers on this subject. His most notable work is the Encyclopædia of Veterinary Medicine, Surgery and Obstetrics, in two volumes, which was published in 1935.

The distinguished British scholar has been vice-principal of the Royal Veterinary College, Camden Town, since 1936 and has served as professor of medicine, hygiene and dietetics since 1908. He is well known in American veterinary circles and various countries of Continental Europe. He has taken a leading part in a number of international congresses, notably that held in Switzerland last summer and the World Dairies Congress, held in Berlin two years ago. From 1906 to 1914, he collaborated with the late Sir Frederick Hobday [whose death is announced on page 260] in editing the *Veterinary Journal*.

Chief among the other offices Professor Wooldridge now holds are: Examiner in veterinary hygiene and meat inspection in the University of London; at times, examiner in the universities of Cambridge, Manchester, Liverpool, Reading, and Bristol; examiner for meat inspector's certificate of the Royal Sanitary Institute; member of the Royal Irish Academy; and honorary consulting veterinary surgeon to the Zoölogical Society.

Earthworms May Be Carriers of Swine Influenza

Science may be on the threshold of an important discovery — the source of influenza epidemics—stated an editorial in the July 22 issue of the *Journal of the American Medical Association*.

The quest for the origin of such scourges as the "flu" epidemic of 1918 has led to hogs and earthworms. So strong is the evidence that the *Journal* warned physicians that hogs and earthworms might logically serve as the source of some future human epidemic.

The editorial described the investigations carried on by R. E. Shope, M.D., of the Rockefeller institute. Dr. Shope's observations are so significant that, if they are confirmed, a great part of the medical literature on virus diseases will have to be rewritten, the *Journal* said.

Through his studies in eastern Iowa, in which he was aided by many prominent Iowa veterinarians, Dr. Shope concluded that earthworms are carriers of the swine influenza virus. He found that earthworms swallow the eggs of swine lungworms and that the larvae of these parasites develop in the earthworms and reënter the hogs when they eat earthworms.

This suggested the possibility of a transformation of the virus in the lungworms or a complete life cycle in the earthworm. Dr. Shope pointed out that lungworm larvae from pigs with swine influenza harbor swine influenza virus throughout their development but that the virus apparently lies latent a great deal of the time.

With the coöperation of eastern Iowa veterinarians, in the fall of 1928, Dr. Shope obtained material from hog autopsies, which he forwarded to the Rockefeller laboratory at Princeton, N. J.

Four Hundred Attend

Second Nutrition Conference for Veterinarians

Approximately 400 practicing veterinarians, educators, and research workers in nutrition from the states of Indiana, Illinois, Michigan, Ohio, and Pennsylvania attended the Second Nutrition Conference for Veterinarians, sponsored by the Central Soya Company, Inc., and held at Decatur, Ind., and Fort Wayne, Ind., July 12. The attendance at this meeting was exactly double that of the firm's first nutrition conference, held in 1938.

The meeting opened in the morning with a tour of the company's plant at Decatur, where veterinarians were shown processes used in producing soybean oil meal and other concentrates. In the afternoon, a session was held at Sunset Park, near Decatur. The subjects discussed during this portion of the program covered a wide range, but the main point of the addresses was the importance of scientific feeding.

L. P. Doyle of Purdue University pointed out that investigations had proved that many of the death losses among new-born pigs were caused by insufficient protein in the ration of pregnant sows.

E. S. Weisner of Michigan State College described the organization of poultry-disease schools for veterinarians in his state under the sponsorship of the state college. Increasing numbers of inexperienced poultry growers having inadequate facilities necessitated the inauguration of the schools, Dr. Weisner explained.

R. M. Bethke of the Ohio Agricultural Experiment Station, in his address on "Soybean Oil Meal—Up to Date," stressed a point mentioned by several other speakers, namely, that the use of this meal does not cause "soft pork" or any animal disease.

H. J. Gramlich, secretary of the American Shorthorn Breeders' Association, told the Conference that producers of live stock are becoming increasingly aware, as the result of experiments in the drouth area of the central states, that corn is not the only food necessary to produce superior meat. Other farm products, properly processed, will serve to improve live stock, he explained.

Paul Gerlaugh of the Ohio Agricultural Experiment Station said that the specialists in nutrition had contributed greatly to the elimination of many diseases among farm animals and increased efficiency of production. He urged continued and increased coöperation with the state experiment stations, who are equipped to provide valuable assistance to veterinarians and feed manufacturers. Likewise, Robert Graham of the University of Illinois emphasized the important services rendered by experiment stations.

Glenn H. Campbell of the Campbell-Sanford advertising company, Cleveland, Ohio, spoke on "Ethical Advertising for Veterinarians." He urged veterinarians to assume more prominent rôles in civic activities.

Jesse Sampson of the University of Illinois presented a paper on "Diagnosis, Treatment, and Prevention of Acetonemia," calling attention to the fact that this condition among dairy cattle and sheep is attributed to various causes. He stressed the matter of adequate carbohydrates for the prevention of this condition.

W. S. Gochenour of Indianapolis, Ind., gave a paper on "The Importance of Laboratory Diagnosis in Poultry Diseases." He explained that quite often it is necessary to resort to the laboratory in order to make accurate diagnoses.

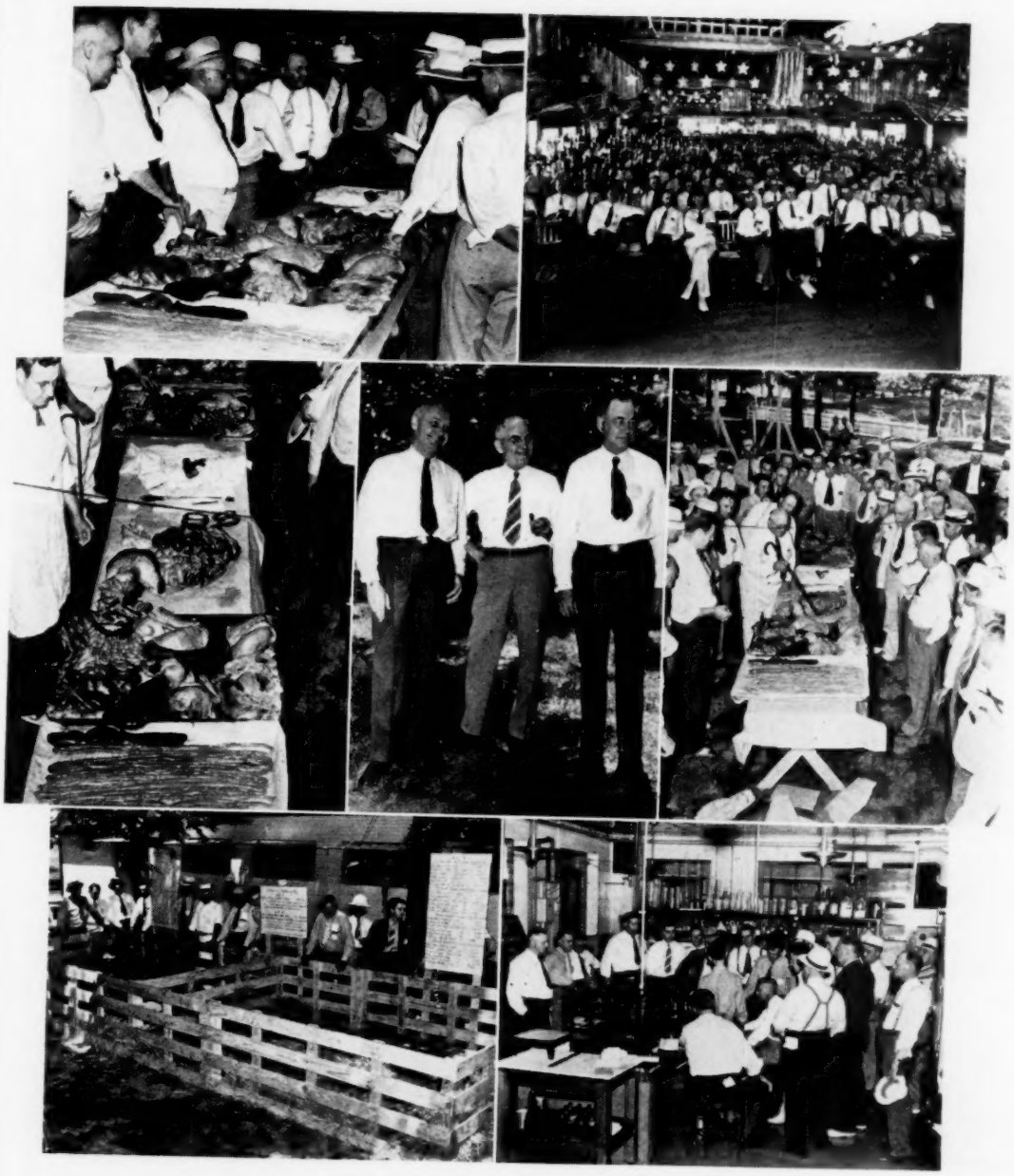
The afternoon session was concluded with a clinical demonstration of the results obtained through feeding pigs high protein rations. This portion of the program was conducted by W. L. Robison of the Ohio Agricultural Experiment Station and A. F. Schalk of the Ohio State University. Pigs used in the feeding experiment were brought to the Conference alive and inspected at the opening of the meeting. At the termination they had been slaughtered and the audience was permitted to inspect the viscera to observe the results of the rations fed.

A banquet held at the Catholic Community Center in Fort Wayne concluded the activities of the day.

New Use for Walnuts

Walnuts, specially ground and mixed with cleaner, are used to remove grime from furs. The new mixture is found to be much more effective than sawdust, which was formerly employed. Experts claim that the shells of walnuts keep the oils in fur and thereby promote longer wear. When the cleaning job is completed, they come out without brushing.

The Scientific Exhibits at Memphis Will Be An Outstanding Feature



AT THE SECOND NUTRITION CONFERENCE

Upper left: The viscera of the two lots of pigs used in the clinical demonstration are being discussed. Upper right: A portion of the audience that attended the conference. Center left: Another view of the viscera used in the clinical program. Middle (left to right): R. G. Knox of the Ontario Agricultural College; D. W. McMillen of Fort Wayne, Ind.; and G. I. Christie of the Ontario Agricultural College. Center right: A. F. Schalk of the Ohio State University points out the effects of high protein rations on the viscera of pigs. Lower left: Inspection of pigs before slaughter. Lower right: A group of veterinarians being shown the analytical laboratory.

U. S. GOVERNMENT

Federal Bureau of Investigation
United States Department of Justice

F.B.I. Seeks Veterinarians' Aid to Track Down Fugitives

In a recent communication to the central office of the A.V.M.A., the Federal Bureau of Investigation, United States Department of Justice, urgently requests the coöperation of veterinarians in its search for two fugitives—John Christopher Abele (alias John Abele, John Able, Cleve Ables, J. C. Allen, John C. Allen, E. E. Beckman, ... Carter, John Christopher, A. B. Conner, J. A. Wilkerson, J. A. Wilkinson) and Roy Douglas Brown (alias R. D. Brown, Ray Douglass Brown, Roy

Left: Roy Douglas Brown (photo taken 1932); right: John Christopher Abele (photo taken 1922).

D. Brown, Roy Knight, LeRoy J. Wright, Roy Wright). Both have rather extensive criminal records and are wanted at present in connection with a holdup in Salem, Ohio, in November of 1935.

John Christopher Abele and his wife, who is believed to be with him, are the owners of a French Bulldog, named "Captain Bouvaire." Roy Douglas Brown and his wife, who also is believed to be with him, own two wire-haired Fox Terriers, one of which is blind. These persons have taken their dogs to veterinarians on quite a few occasions and it is highly conceivable that they may soon again seek service of this nature.

Roy Douglas Brown is 5 feet, 9 inches in height, weighs 155 pounds, and is 38 years old. He has blue-gray eyes, chestnut hair, and is fair complexioned. He is white, and an American. His occupation is given as that of a salesman. Brown has a large vaccination scar and several moles on his left arm; a scar on the right wrist; and several moles on his back. He is an excellent golfer. Usually, his blind, white wire-haired Fox Terrier accompanies him.

Brown's wife, Raymonde Brown, is about 36 or 37 years of age, weighs 112 pounds, and is 5 feet, 6 inches tall. She is a very light, natural blonde and wears her hair bobbed. Her eyes are blue and her complexion is fair. She wears expensive, tailored suits and always looks smartly dressed. She is a good golfer and enjoys sporting events. She is of the very bossy type, dominates her husband, and talks loudly.

John Christopher Abele is 37 years of age, 5 feet, 9¼ inches in height, and weighs 160 pounds. He has blue eyes, light chestnut hair, and is fair complexioned. His build is slender. His lips are thin. He is a radio technician, white, American. He wears a small, fine mustache that is hardly noticeable. Like Brown, he is an excellent golfer. Usually, he is accompanied by a small, brown French Bulldog. He is square-jawed and uses poor English.

His wife, Betty Christopher, is about 27 years of age; of medium build; 5 feet, 3-4 inches in height; and weighs between 115 and 120 pounds. Her hair is dark brown and she wears it bobbed. Her eyes are brown and her complexion is dark. She dresses very well—smart, expensive clothes. Her grammar is fair.

The F.B.I. will be grateful for any information that readers of the Journal can furnish relative to these individuals.

Bureau of Animal Industry
United States Department of Agriculture

Chief of B.A.I. Laments Shortage of Veterinarians

The report of John R. Mohler, chief of the U. S. bureau of animal industry, September 30, 1938, says:

> Bang's disease of cattle has continued to dominate the interest and concern of cattle owners. In its endeavor to curb this malady, the Bureau has conducted an extensive cattle-testing project and, simultaneously, an active research program. The year's work revealed a *greater demand for testing than could be supplied with the forces available.* [Italics by Jour. A.V.M.A.] Blood tests were made on more than 7,800,000 head in approximately 671,300 herds. Of the animals tested, 4.1 per cent reacted . . . at the close of 1938, 9,500,000 head were under supervision and a million were on the waiting list of the Bang's disease project.

Bureau Develops Dual Purpose Sheep for Small Farmer

To aid small farm operators who depend upon a small flock of sheep as a source of cash income, the B.A.I. has developed through

an eight-year selective breeding program the Southdale, a cross between the Southdown and Corriedale.

The Southdown is noted for its mutton quality, but it produces a lightweight, short, staple fleece. The wool, however, is of a high quality. The Corriedale, on the other hand, is comparatively inferior in mutton quality but produces a heavy, long, staple fleece, high in quality.

In the crossbred sheep, or Southdale, the wool yield is reported to excel that of the Southdown, and the mutton quality that of the Corriedale. However, the Southdale does not equal the Southdown in mutton quality or the Corriedale in wool production.

B. A. I. Transfers

HENRY J. OSTERHOLTZ (K. S. C. '34), from Little Rock, Ark., to West Fargo, N. Dak., on meat inspection.

WILBERT E. OSTERHOLTZ (K. S. C. '35), from Saint Louis, Mo., to Oklahoma City, Okla., on meat inspection.

CHARLES F. PRCHAL (K. S. C. '35), from Oklahoma City, Okla., to Richmond, Va., on Bang's disease.

KENNETH L. RITCHIE (Iowa '33), from Boise, Idaho, to Des Moines, Iowa, on Bang's disease.

ISRAEL M. SATUREN (U. P. '37), from Nashville, Tenn., to New York City, on meat inspection.

ROBERT F. TOLLEY (Colo. '38), from Oklahoma City, Okla., to Baltimore, Md., on Bang's disease.

ALVEN O. TUDOR (Colo. '20), from Oklahoma City, Okla., to Frankfort, Ky., on Bang's disease.

LILLIS R. WEMPE (K. S. C. '35), from Oklahoma City, Okla., to Richmond, Va., on Bang's disease.

THOMAS J. WHEELIN (O. S. U. '37), from Denver, Colo., to Boise, Idaho, on Bang's disease.

FRED J. BARDSLEY (U. S. C. V. S. '15), assistant veterinarian at Montpelier, Vt., retired at the close of March 31, 1939.

WILLIAM H. DAVENPORT (McK. '12), assistant veterinarian at Chicago, Ill., retired at the close of May 31, 1939.

HARRY J. MCCAULEY (Chi. '18), from Chicago, Ill., to Sioux City, S. Dak., on meat inspection.

ARTHUR A. MILLER (A. P. I. '22), from Montgomery, Ala., to Chicago, Ill., on meat inspection.

PETER H. MOMMSEN (Chi. '16), from Jackson, Miss., to Memphis, Tenn., on meat inspection.

OLIN S. PACKWOOD (K. C. V. C. '16) from Pierre, S. Dak., to Bismarck, N. Dak., on Bang's disease.

EDWARD C. PHIPPS (O. S. U. '34), from Frankfort, Ky., to Charleston, W. Va., on Bang's disease.

TODD P. ROTHROCK (Iowa '34) from Frankfort, Ky., to Charleston, W. Va., on Bang's disease.

ISRAEL M. SATUREN (U. P. '37), from Richmond, Va., to Nashville, Tenn., on Bang's disease.

DANIEL B. SCHLOSSER (A. P. I. '37) from Frankfort, Ky., to Charleston, W. Va., on Bang's disease.

ALBERT V. SCHWARTZ, JR. (K. S. C. '38), from Baton Rouge, La., to Bismarck, N. Dak., on Bang's disease.

WALTER J. STEWART (Nat'l. '94), from Stockton, Calif., to Berkeley, Calif., in chg. V. S. C.

The appointment of Fred B. Jones (U. S. C. V. S. '13), assistant veterinarian at Louisville, Ky., was terminated on May 4, 1939, on account of death.

Bureau of Entomology and Plant Quarantine United States Department of Agriculture

ENTOMOLOGISTS DEVELOP EFFECTIVE TREATMENT FOR SCREWWORMS

An effective and economical way to protect live stock from screwworms has been developed by the U. S. bureau of entomology and plant quarantine.

The treatment consists in applying finely ground diphenylamine to any break in the skin of cattle, sheep, horses, or hogs that may be exposed to screwworm flies.

The bureau's tests show that diphenylamine poisons young screwworms hatching out in wounds on animals. Enough of this powdered chemical to kill any worms that may hatch for several days will stick to the animal tissues. It is recommended that the treatment be applied every three days until all of the injuries have healed entirely.

The chemical will not kill large screwworms, however. Benzol is still prescribed for the first treatment of wounds that have become infested. But, once the large worms have been killed by benzol, applications of diphenylamine every three days will prevent the development of others.

Regular Army

Major Jack G. Fuller is relieved from duty at Fort Snelling, Minn., about September 1, 1939, and assigned to duty at Carlisle Barracks, Pa.

Orders assigning Lt. Colonel Edward M. Curley to duty at Fort MacArthur have been amended so as to assign him to station at Los Angeles, Calif., and additional duty as attending veterinarian at Fort MacArthur, Calif., and Fort Rosecrans, Calif.

Veterinary Corps Reserve

NEW ACCEPTANCES—FIRST LIEUTENANTS

Abbott, John Elden, 1519 Poyntz Ave., Manhattan, Kans.

Andrews, Francis Whipple, RR No. 2, Rupert, Idaho.

Barrows, Ernest D., 801 Elizabeth St., Ft. Collins, Colo.

Berkowitz, Israel, 487 Ridgewood Ave., Brooklyn, N. Y.

Blood, Benjamin Donald, 110 Jackson St., Columbia City, Ind.

Brinker, Wade Oberlin, RR No. 1, Massilon, Ohio.

Burdo, Anthony Michael, 490 Prospect Ave., Brooklyn, N. Y.

Burg, Nathan Walter, P. O. Box 966, Yakima, Wash.

Burr, Franklin Harold, 247 Audley St., South Orange, N. J.

Cameron, Walter Earnest, Torrington, Wyo.

Casselberry, Norwood Harry, 604 No. 5th St., Savanna, Ill.

Clark, Forrest William, RR No. 2, Jewell, Kan.

Coddington, Alton Monroe, RR No. 1, Alexander, Kan.

Collins, Wayne Devere, Marysville, Kan.

Conrad, Harry Jacob, 431 No. 16th St., Kansas City, Kan.

Cocoran, John Robert, RR No. 2, Grand Junction, Colo.

Curry, Philip Henry, 2510 No. 11th St., Kansas City, Kan.

Deane, Harold Myers, 601 Smith St., Ft. Collins, Colo.

DeCinque, Peter, Woodbine, N. J.

Decker, Clifford Newton, Arlington, Neb.

Denton, John Patton, 1130 Vattier St., Manhattan, Kan.

Dietrich, William Hyde, Spivey, Kan.

Eskeldson, James Andrew, RR No. 1, Ramona, Kan.

Evans, David Edward, RFD No. 2, Box 61, Montrose, Colo.

Feldman, Murray, 3021 East 7th St., Brooklyn, N. Y.

Fisher, Vurl Eldon, 1323 E. Center St., Rochester, Minn.

George, Eugene Wesley, Box 85, Nestor, Calif.

Germanio, Peter Joseph, RFD, Box 94, Woodbine, N. J.

Gorman, Harry Arthur, 2052 Elm St., Denver, Colo.

Gross, Glenn Gorden, RR No. 3, Russell, Kan.

Guilfoil, Thomas Joseph, 221 No. 17th St., Kansas City, Kan.

Hamilton, Clare C., RR No. 1, Geneseo, Kan.

Hantman, Harris Warren, 84 Beaver St., Brooklyn, N. Y.

Havlik, Albert Leo, Tampa, Kan.

Henrikson, Merle Logan, 1725 Anderson Ave., Manhattan, Kan.

Herzberger, Arthur Conrad, 3383 W. 30th St., Denver, Colo.

Humphreys, Virgil John, Worland, Wyo.

Innes, Donald Clayton, 411 St. Vincent St., Philadelphia, Pa.

Irvin, Charles Earl, Jr., 522 No. Clementine, Anaheim, Calif.

Jameson, Lloyd Edward, 411 Tremont St., Mauston, Wis.

Jokerst, Herman August, Rural Route, Waco, Neb.

Jones, Raymond Albert, RR No. 1, Penalosa, Kan.

Jordon, Frank Wilson, RR No. 4, Beloit, Kan.

Kanawyer, Wendell Lee, 178 E. 8th St., Cucamonga, Calif.

Knappenberger, Jack Ross, 1629 E. "G" St., Hutchinson, Kan.

Lee, Robert Jerome, 532 W. 164th St., New York, N. Y.

Lougbridge, Henry, Lyndon, Kan.

MacLean, George James, Route No. 1, Box 169, Littleton, Colo.

Malle, Albert Leon, 313 W. 4th St., Mulberry, Kan.

Massey, Joseph Raymond, Jr., Sun City, Kan.

Miller, Leonard John, RR No. 1, Clarkson, Neb.

Morton, Lynus Robert, Toronto, Kan.

Mossman, Donald Fleet, 1130 Vattier St., Manhattan, Kan.

Nebb, Samuel Siskind, 775 Blake Ave., Brooklyn, N. Y.

Nelson, Walbert Oscar, RFD No. 1, Olsburg, Kan.

Mossov, Morris Aaron, 1664 Weebs Ave., New York, N. Y.

Pastor, John Herbert, 417 E. Magnolia St., Ft. Collins, Colo.

Prendergast, Walter Bruce, Route 1, Box 189, Ft. Collins, Colo.

Reinow, Bert, 2100 E. Ridgewood Ave., Paramus, N. J.

Turner, Nathan Allen, 328 W. Mountain Ave., Ft. Collins, Colo.

Viergutz, Herbert Edward, Box 104, Lee's Summit, Mo.

Vierheller, Ralph Charles, Box 33, Sonora, Calif.

Wiser, Horace Verne, Brigham City, Utah.

NEW ASSIGNMENT TO ACTIVE DUTY WITH CCC

Captain Fay Elton Broad, Indiana District.

TERMINATION OF ASSIGNMENT TO ACTIVE DUTY WITH CCC

Captain Rudolph H. Omdalen, West Virginia District.

AMONG THE STATES

Alabama

The third semiannual meeting of the Southern Alabama-Western Florida Veterinary Medical Club was held at Brewton, Ala., April 20, 1939.

Verbal sketches of cases encountered in everyday practice constituted the major portion of the program.

The next meeting of the group will be held in Mobile, Ala., September 29. A fishing trip is planned for the day following this session.

E. M. NIGHBERT, *Secretary.*

California

The 51st annual meeting of the California State Veterinary Medical Association was held at the Barbara Hotel, Santa Barbara, June 26-28, E. E. Jones presiding.

Over a score of clinical demonstrations and scientific papers were included in the three-day affair. Out-of-state speakers were H. D. Bergman, Iowa State College, Ames, Iowa; E. E. Wegner, State College of Washington, Pullman, Wash.; and C. R. Donham, Ohio State University, Columbus, Ohio.

Connecticut

The State Board of Veterinary Registration and Examination held examinations on July 5. Eighteen of 20 who filed applications were in attendance, two of whom were lady veterinarians. This is the largest number of applicants ever examined by the state and the first time that ladies have taken the examination.

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During the past session of the Connecticut legislature, $50,000 was appropriated for indemnity payments on Bang's disease reactors. The act provides for the vaccination of calves 4 to 8 months of age in untested herds. The vaccine for this purpose is to be furnished gratis to the owner, the owner paying only the veterinarian's fees.

The legislature also passed an act whereby the state commission on domestic animals must assign any graduate accredited veterinarian to conduct a test or other disease control measures who may be selected by the owner of the herd.

Dominican Republic

An old law is now being enforced requiring all male farm animals undesirable for breeding purposes, especially horses, to be castrated.

A new law is being enacted to control the importation, sale, and use of biological products and veterinary therapeutic specialties.

Illinois

The number of horses and mules in the state is given as 851,000 in the report for 1935 of the United States Department of Agriculture.

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Walter E. Armstrong, secretary and general sales manager of Chappel Bros., Inc., of Rockford, resigned his post on July 8, thereby terminating an eleven-year association with the firm.

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The Illinois State Board of Veterinary Examiners reported the largest attendance in 20 years at the examinations held in Chicago, July 24-25.

Iowa

The clinical exhibit of the small animal section at the all-day practitioner's clinic of the Eastern Iowa Veterinary Association, held at Waterloo, June 20, was one of the outstanding features of the session.

It comprised the surgical treatment of cases and also a laboratory section, conducted by M. W. Sloss of Iowa State College, Ames, and H. C. Smith of Fort Dodge. During the course of the day, several cases were diagnosed and a number of surgical cases were operated.

There was a registration of over 400 veterinarians plus many owners of live stock who presented their animals for treatment.

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Iowa stands second to Texas in horse and mule population. Texas has 1,580,000 horses and mules; Iowa, 960,000.

Kansas

The Kansas State Board of Veterinary Examiners, in special session at Manhattan on May 26, examined 54 candidates. Fifty-two made passing grades. At the same meeting, the Board was reorganized as follows: J. I. Kirkpatrick of Sedgwick, president; A. H. Gish of El Dorado, member; and Thos. P. Crispell of Parsons, secretary.

Maine

A. E. Coombs, secretary of the Maine Veterinary Medical Association, was injured while treating a horse recently. The animal fell on him, with the result that his first lumbar vertebra was severely injured. Mrs. Coombs was on the scene at the time and rushed him to the hospital. He has been confined to bed ever

since, but latest reports indicate that he is recovering.

Massachusetts

The oldest municipal meat and milk inspector in the United States, as far as available records show, was William H. Dodge of Leomister. He was retired in June at the age of 74 after serving for 42 years in that capacity. Dr. Dodge was an employé of the Leomister health department since April 1, 1897, and served continuously until his retirement. He was known as "inspector of animals, milk and slaughtering."

Mexico

Gervasio W. Mackie (Ont. '98) of Jalisco, a retired veterinarian who has established himself as an author of note, has written a book entitled, "The Story of Carolina Morelos," which will be published soon. He is the author of "The Story of Maggie McGill" and has also written many short stories. For 20 years, Dr. Mackie represented the Cutter Laboratories in Mexico and Guatemala.

Michigan

Dr. (M.S.C. '31) and Mrs. James H. Campbell of DeWitt announce the birth of a son on July 4, 1939.

Nevada

Governor E. P. Carville has reappointed the entire membership of the Nevada State Board of Veterinary Medical Examiners for three-year terms. The organization of the Board is as follows: F. H. Baker of Gardnerville, president; Geo. E. Bamberger of Reno, member; and W. B. Earl of Reno, secretary.

New Mexico

T. I. Means (Colo. '20) of Santa Fe acted as veterinarian and representative of the S. P. C. A. while the Paramount Studios, working near Santa Fe, filmed "The Light That Failed."

New York

The 49th annual meeting of the New York State Veterinary Medical Society was held at the Hotel Utica, Utica, July 13-15, L. J. Tillou of East Aurora presiding. Many excellent papers and clinical demonstrations were featured during the three-day session.

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The regular monthly meeting of the Veterinary Medical Association of New York City was held at the Hotel New Yorker on the evening of May 3, President Engle calling the session to order at 8:30.

Erwin Jungherr, research animal pathologist of the Storrs (Conn.) Agricultural Experiment Station, was the guest speaker, and he presented a paper on "Intracranial Tumors in Animals." He interpolated his presentation with drawings and lantern slides.

Case reports were presented by Ray W. Gannett, H. W. Gardner and C. H. Hoefle. Their subjects were, respectively: Some Unusual Cases of Canine Distemper; Jaundice in a 4-Month-Old Dog; and Canine Spleenopathy. In order, S. H. Shindell, Leon Roth and C. E. DeCamp carried the discussions of these cases.

L. A. Merillat, executive secretary of the A.V.M.A., was present at the meeting. He discussed several of the proposed changes in the policies of the national organization, making particular reference to the editorial character of the *Journal*.

Dr. DeCamp suggested that abstracts of scientific material presented at meetings be compiled and published.

C. R. SCHROEDER, *Secretary*.

North Carolina

The North Carolina State Veterinary Medical Association held its 38th annual meeting at Charlotte, June 28-29, with 86 veterinarians in attendance, 14 of whom were visitors from other states. The presence of ladies and other visitors brought the attendance to over 130.

D. A. Eastman of Moline, Ill., conducted a question-and-answer session on diseases of small animals and officiated as clinician during a demonstration of intestinal surgery. W. R. Krill of Columbus, Ohio, discussed cattle practice and gave a clinical demonstration on the delivery, with the use of a feotome, of colts and calves in dystokia cases. B. T. Simms, B.A.I. regional director, Auburn, Ala., gave a very entertaining and practical talk on new developments of interest to practitioners. B. M. Lyon of Pearl River, N. Y., gave a paper on rabies, and Oscar J. Houser, eye, ear and nose specialist of Charlotte, presented a paper on common diseases of the eye.

The banquet, held at the Elks Club on the Catawba River, 10 miles from Charlotte, was well attended. M. M. Leonard of Asheville acted as toastmaster and presented Oren Moore, physician and surgeon of Charlotte, who spoke on the history of medicine.

By unanimous vote, A. A. Husman of Raleigh was reëlected president. Also reëlected were C. E. Nicks of Elkin, 1st vice-president; B. H. Staton of Rocky Mount, 2nd vice-president; and J. H. Brown of Tarboro, secretary-treasurer. N. B. Tyler of Raleigh and Wm. G. Chrisman of Chapel Hill were elected directors. H. J. Rollins of Rockingham and J. H. Brown were nominated for vacancies on the North

Carolina State Board of Veterinary Medical Examiners.

Rocky Mount was selected as the meeting place for 1940. J. H. BROWN, *Secretary.*

North Dakota

The 35th annual meeting of the North Dakota Veterinary Association was held at Minot, June 29-30. Sixty-seven veterinarians from North Dakota and Canada attended the meeting.

The following speakers contributed to the program: John A. Cowan, M. D., of Bismarck; Mr. Culver S. Ladd of Bismarck; F. M. Bolin, North Dakota Agricultural College, Fargo; Fred C. Driver, inspector-in-charge, B.A.I., Bismarck; James Farquharson, Colorado State College, Fort Collins, Colo.; and W. L. Boyd, University Farm, Saint Paul, Minn.

Entertainment was provided for the ladies by the general arrangements committee. A dinner followed by a dance was held on the evening of the first day. The afternoon of June 30 was devoted to a clinic conducted by Drs. Farquharson, Boyd, and Winslow.

Officers were elected for the ensuing year as follows: C. H. Hofstrand of Leeds, president; R. E. Krieger of Williston, vice-president; M. C. Hawn (reëlected) of Fargo, secretary-treasurer.

It was voted to hold the 1940 meeting in Fargo.

M. C. HAWN, *Secretary.*

Ohio

The following letter was sent to President Roosevelt by Wm. J. Pirie, secretary of the 1939 advisory committee of the Eastern Iowa Veterinary Association:

P. O. Box 44,
Cedar Rapids, Iowa,
May 14, 1939.

To His Excellency the President of the United States:
Sir:

The live stock producers of the Middle West have taken wide exception to your recommendation to Secretary of the Navy Swanson to buy canned Argentine beef as cheaper and better in quality than our own.

We realize your position in regard to the South American countries and that our citizens must make proper and necessary concessions and practice reciprocity for such good customers of ours.

Our membership is made up of veterinarians in private practice who are the servants of a public largely dependent upon the livestock industry. Our members strive to keep the live stock healthy on the farms. We know that there is no comparable veterinary service in the Argentine.

Many of our members have served in the great coöperative projects of the Bureau of Animal Industry, United States Department of Agriculture, in the eradication of tuberculosis and foot-and-mouth disease from the cattle of the United States. We are told that foot and mouth disease is constantly ravaging the cattle herds of the Argentine.

Many of our members have served in the meat inspection division of the Bureau of Animal Industry, United States Department of Agriculture, a service renowned but justly and acknowledged by authorities to be the greatest and the most efficient in the whole wide world.

We do feel that yours was a grievous error, in the statement attributed to you, in your disregard of the United States meat inspection service. We do not believe that any persons fed by the federal government should be required to eat meat or meat food products not United States inspected and passed, through slaughter and processing.

A portion of the group which attended the banquet of the California State Veterinary Medical Association, 51st annual meeting, Barbara Hotel, Santa Barbara, Calif., June 26-28.

We also feel that, as the president of the United States, you have set a most unfortunate example for domestic consumers of meat in proclaiming the quality of any meat not United States inspected and passed as better than that prepared under the supervision of your faithful and efficient corps of meat inspection employés in the abattoirs of the United States.

Yours respectfully,
(signed) WM. J. PIRIE, Secretary,
1939 Advisory Committee,
The Eastern Iowa Veterinary Association, Inc.

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Associate Editor Case writes that the state legislature has passed the Bang's law appropriating $350,000 to be used in the control of Bang's disease in the next two years. With this amount matched by the federal government, the Bang's disease program in force will continue without decreasing momentum.

Oklahoma

The 24th semiannual meeting of the Oklahoma Veterinary Medical Association was held at Sulphur, June 5-6, with headquarters at the Artesian Hotel.

The literary portion of the program consisted of:

"Virus Diseases," C. L. Campbell, Kansas City, Mo.

"Anaplasmosis," E. W. Meads, Claremore, Okla.

"Problems Encountered with an Experimental Flock of Sheep," R. D. Turk, Texas Agricultural Experiment Station, College Station, Texas.

"Equine Encephalomyelitis," C. L. Campbell, Kansas City, Mo.

"Acetonemia," M. L. Bergsten, Tonkawa, Okla.

On the afternoon of June 5, a trip was made to the Goddard game farm. From there, the group went to the Cooper and Patterson Hereford ranch, where a barbecue dinner was served. The journey back to Sulphur was made by way of Turner Falls, which, located in the Arbuckle Mountains, is one of the showplaces of southeastern Oklahoma.

The afternoon of June 6 was given over to a trip to the Harper and Turner ranch.

F. Y. S. MOORE, *Secretary.*

Tennessee

During the month of June, there were six outbreaks of hemorrhagic septicemia in the State of Tennessee; two outbreaks of anthrax and two of blackleg; 83 outbreaks of hog cholera; and ten of erysipelas.

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Members of the Committee on Local Arrangements for the Memphis meeting are now adding the final touches to the convention plans.

Texas

The Texas State Veterinary Medical Association has a bill before the House at Austin, Texas, to change the annual registration fee of veterinarians from $1.00 to $10.00.

Southwestern Texas has passed through a severe drouth which necessitated the shipping of several thousand head of stocker and feeder cattle to the North and Northwest for pasturing.

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San Antonio, through its new mayor, Maury Maverick, has inaugurated the plan of employing graduate veterinarians in place of lay inspectors in all local packing plants. This has given positions to six veterinarians at a salary of $150 per month.

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With an attendance which taxed the capacity of the amphitheatre of the veterinary hospital, the State Veterinary Medical Association of Texas convened for its 16th semiannual meeting at the School of Veterinary Medicine, Texas Agricultural and Mechanical College, College Station, June 6-7. A well balanced program presented by capable speakers made the affair one of the most successful in the history of the Association.

James Farquharson of Colorado State College, Fort Collins, Colo., and E. J. Frick of Kansas State College, Manhattan, Kan., were the visiting speakers. Dr. Farquharson discussed large animal practice and gave some surgical demonstrations, while Dr. Frick discussed small animal practice and surgery. H. L. Van Volkenberg of Texas A. & M. College discussed deficiency diseases of farm and ranch animals. The School of Veterinary Medicine held conferences on milk and meat hygiene, serology diagnoses, laboratory diagnosis of parasitic diseases, and poisonous plants. All of the conferences were well attended.

The Ladies' Auxiliary enjoyed a busy two-day program, which included a theatre party, a visit to the Sam Houston park at Huntsville, and a breakfast party and visit to the college museum.

Twenty-two applicants were admitted to the membership roll of the Association.

The 30th annual meeting will be held at San Antonio in January of 1940.

M. B. STARNES, *Corres. Sec'y.*

Utah

The Utah Veterinary Medical Association held its annual meeting at Logan, June 29-30. The first day was devoted to the reading of papers and a clinic filled out the second day.

E. R. Frank of Kansas State College, Manhattan, Kan., was the guest speaker and gave two interesting lectures on equine and bovine practice. The other presentations were as follows:

"Fractures in Small Animals and Their Treatment," Jean Flint, Salt Lake City, Utah.

"Some Phases of Municipal Meat Inspection," E. G. Cole, Salt Lake City.

"Poultry Diseases," Hugh Hurst, Salt Lake City.

"Diseases of Deer in Relation to Overbrowsing on Utah Ranges," E. R. Quortrup, U. S. biological survey, Brigham City, Utah.

"The Calfhood Vaccination Program for Bang's Disease in Utah," C. L. Jones, U. S. bureau of animal industry, Salt Lake City.

"Common Diseases Encountered in Fur-Bearing Animals," Archie D. Egbert, Smithfield, Utah.

Dr. Frank conducted the clinic, which proved very interesting. Undoubtedly, he won many new friends during his visit in Utah.

E. D. LEIBY, *A. V. M. A. Secretary for Utah.*

Virginia

The Virginia State Veterinary Medical Association held its 46th annual meeting at the Monticello Hotel, Norfolk, July 12-14, J. E. Greer of Pulaski presiding. Many excellent scientific papers were presented.

Wisconsin

The laws of Wisconsin permit the vaccination of certain herds of cattle that have been tested for Bang's disease where it was found that 50 per cent or more were positive to the test. The vaccination must be done under the supervision of the division of live stock sanitation and a vaccine approved by the United States Department of Agriculture must be used. Calfhood vaccination is permitted only in clean herds outside of area-tested counties, but there is little demand for this class of vaccination because Wisconsin depends a great deal upon the sale of dairy cattle and it is practically impossible to sell a cow unless she is negative to the Bang's disease test.—*V. S. Larson, Holstein-Friesian association meeting. Peoria, Ill., January, 1939.*

COMING MEETINGS

World's Poultry Congress, Seventh Annual. Cleveland, Ohio. July 28-August 7, 1939. W. R. Hinshaw, Chairman, Section on Pathology and Disease Control, University Farm, Davis, Calif.

Small Animal Hospital Association. Los Angeles, Calif. August 1, 1939. R. W. Gerry, Secretary, 8474 Melrose Ave., Los Angeles, Calif.

Connecticut Veterinary Medical Association. Pease House, Saybrook Point, Conn. August 2, 1939. Geo. E. Corwin, Secretary, State Office Building, Hartford, Conn.

Dallas-Fort Worth Veterinary Medical Society. Adolphus Hotel, Dallas, Texas. August 3, 1939. H. V. Cardona, Secretary, 2736 Purington Ave., Fort Worth, Texas.

Vermont Veterinary Medical Association. Hotel Berwick, Rutland, Vt. August 4-5, 1939. G. N. Welch, Secretary, 43 Union St., Northfield, Vt.

Saint Louis District Veterinary Medical Association. Melbourne Hotel, Saint Louis, Mo. August 9, 1939. J. P. Torrey, Secretary, 610 Veronica Ave., East Saint Louis, Ill.

Southern California Veterinary Medical Association. Chamber of Commerce Bldg., Los Angeles, Calif. August 16, 1939. Charles Eastman, Secretary, 725 S. Vancouver Ave., Los Angeles, Calif.

Memphis on Ol' Man River

—Cut Courtesy of North American Veterinarian.

Airview of the A.V.M.A. convention city, August 28 to September 1.

San Diego County Veterinary Medical Association. Zoölogical Research Bldg., Balboa Park, San Diego, Calif. August 21, 1939. Glenn A. Tucker, Secretary, Vista, Calif.

Kansas City Veterinary Medical Association. Kansas City, Mo. August 21, 1939. S. J. Schilling, Secretary, Box 167, Kansas City, Mo.

American Veterinary Medical Association. Peabody Hotel, Memphis, Tenn. August 28-September 1, 1939. L. A. Merillat, Executive Secretary, 221 N. LaSalle St., Chicago, Ill.

Chicago Veterinary Medical Association. Hotel Sherman, Chicago, Ill. September 12, 1939. W. A. Young, Secretary, 157 W. Grand Ave., Chicago, Ill.

Willamette Valley Veterinary Medical Association. Albany, Ore. September 13, 1939. T. Robert Phelps, Secretary, 1514 Washington St., Oregon City, Ore.

Massachusetts Veterinary Association. Boston, Mass. September 27, 1939. H. W. Jakeman, Secretary, 44 Bromfield St., Boston, Mass.

Southern Alabama-Western Florida Veterinary Medical Club. Mobile, Ala. September 29, 1939. E. M. Nighbert, Secretary, Cantonment, Fla.

PERSONAL NOTES

A. H. DEGROOT (Gr. Rap. '17) of Dundee, Mich., was rendered unconscious when kicked in the head by a colt on May 23. He was taken to the Monroe (Mich.) Hospital for treatment. Four sutures were required to close the scalp wound. Latest reports indicate that he is well on the way to recovery.

GRANVILLE W. BREED (Chi. '18) was appointed director of agriculture and conservation for the State of Rhode Island on March 29, 1939. This is the first time in the history of the state that a veterinarian has been appointed as head of the department of agriculture.

DEATHS

Sir Frederick T. G. Hobday, illustrious veterinary surgeon of England, died in Droitwich, Worcestershire, on June 24, 1939, at the age of 69.

Sir Frederick was honorary veterinary surgeon to the king of England. He served with the British army in the World War in France, Belgium, Italy, and Albania. He was an honorary lecturer in comparative medicine at St. George's Hospital Medical School; an honorary fellow of the Royal Society of Medicine and of the Hunterian and Harveian societies; and a fellow of the Royal College of Veterinary Surgeons and the Royal Society of Edinburgh.

He edited the *Veterinary Journal* and Courtenay's "Veterinary Medicine," and was the author of "Anæsthesia of Animals and Birds" and "Canine and Feline Surgery."

Sir Frederick received his veterinary doctor's degree from Zurich University. At one time he served as principal and dean of the Royal Veterinary College. He was an honorary member of the A.V.M.A.

Walter R. Van Ness of Mason, Ohio, died on June 3, 1939, at Christ Hospital, Cincinnati, Ohio.

Born at Mechanicsburg, Ohio, February 22, 1886, Dr. Van Ness was graduated from the Ontario Veterinary College in 1907. Following, he took graduate work at the McKillip Veterinary College for one year. He then practiced for five years at London, Ohio. Thereafter, he served with the U. S. bureau of animal industry. He was retired because of illness shortly before his death.

Dr. Van Ness joined the Association in 1919.

Joseph L. Wilder of Akron, N. Y., died on March 2, 1939.

Born at Akron on February 12, 1876, Dr. Wilder was graduated from Cornell University in 1901. He joined the Association in 1916.

Frank H. Mackie of North East, Md., died on May 18, 1939, at the age of 74.

A graduate of the University of Pennsylvania, class of 1889, Dr. Mackie practiced in Cecil county, Md., until 1899. Following, he moved to Baltimore remaining there until 1917, when he joined the army as a captain. After the War, he retired to his farm in North East.

Dr. Mackie joined the Association in 1894.

A. A. Kritt of Albany, Ga., died on June 7, 1939, after an illness of five months.

Dr. Kritt was born at Pottava, Russia, on September 14, 1896. A graduate of the Ohio State University, class of 1920, he was engaged in the service of the U. S. bureau of animal industry at the time of his death.

He joined the Association in 1920.

David L. Bolger of Cambridge, Mass., died on June 7, 1939. He was a graduate of McGill University, class of 1892. Dr. Bolger joined the A.V.M.A. in 1907.

Robert G. Bose of Troy, N. Y., died on June 22, 1939, following an emergency operation for appendicitis. He had been suffering since last November from a severe nervous breakdown and had been unable to carry on his practice.

Dr. Bose was graduated from the New York-American Veterinary College in 1901. He joined the national association in 1913.

Sequence in production of Jen-Sal Equine Encephalomyelitis Vaccine (Chick)

(1) Newly constructed laboratory building exclusively devoted to production of Encephalomyelitis Vaccine (Chick).

(2) Inoculating eggs. A small opening is drilled in the egg which is then placed on the turnstile conveyor which carries it to an adjoining room where the virus is inoculated into the embryonic tissue. Opening is then sealed with wax.

(3) Grinding, filtering, cooling, diluting, collodizing and formalizing are preparation processes of prime importance. Note type of protecting appliances and clothing worn by the operator.

(4) Guinea pigs have a controlling role as these test animals give evidence of vaccine potency, virus concentration, etc. Note spots on cranium indicating location of subdural virus inoculation of test pigs.

(5) Filling the tested and approved product in final containers.

(6) Drilling eggs for virus inoculation and arranging trays for subsequent incubation.

(7) The embryo suspended between the scissors blades has just been aseptically removed from the incubated egg and is about to be deposited in the jar for final processing.

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